POSSIBILITY OF PRODUCING ETHANOL FROM *MORINGA OLEIFERA* PRESS CAKE

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POSSIBILITY OF PRODUCING ETHANOL FROM MORINGA OLEIFERA PRESS CAKE

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Thesis submitted in partial fulfilment of the requirements
for the award of the degree of
Bachelor of Chemical Engineering (Gas Technology)

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JUNE 2014

SUPERVISOR'S DECLARATION

We hereby declare that we have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor of Chemical Engineering (Gas Technology).

Signature :
Name of main supervisor : DR EMAN N.ALI
Position :
Date :

STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree.

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Date : JULY 2014

Dedication

To my supervisor, Dr. Eman N.Ali for her support in making this research successful and also to my parents, Amran bin Budin and Salmah binti Mohd always giving moral support to finish this project.

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ABSTRACT

In recent decades is the energy crisis and environmental issue become critical problem in the world. The cause depleting the reserved of fossil fuel, therefore the people start find the alternative fuel to replace fossil fuel. Many research have been done to find alternative fuel to fulfill increasing energy demand. Recently, biofuel (bioethanol) had been proposed as replacement of fossil fuel. There are countless raw materials that can be used to produce ethanol such as jatropha cakes, castor cakes, palm oil cakes and *Moringa oleifera* cakes. The *Moringa oleifera* is multifunctional used plant. From leaves until roots of *Moringa oleifera* plant can give benefit to a human. The *Moringa oleifera* also known as miracle tree. The composition of *Moringa oleifera* press cake is quite similar with composition of jatropha such as cellulose, hemicellulose, lignin and other compositions. That means the *Moringa oleifera* press cake also can produce ethanol. In order to produce ethanol from press cake, the following step must be followed, pre-treatment with dilute acid to break down the cellulose of press cake, acid hydrolysis for converting the cellulose to simple sugar like glucose and fermentation by using *Saccharomyces cerevisiae* to produce ethanol. The parameters involved in this study is concentration of acid during hydrolysis with 2%, 4% and 6% of sulphuric acids, different of mass yeast with 2g, 4g and 6g and different period of fermentation with 3 days, 5 days and 7 days. Based on the result obtained, the increasing of concentration acid during hydrolysis giving the low concentration of ethanol. For mass of yeast, the best yield was at 2g and the lowest yield was at 6 g. For period fermentation, the amount of ethanol was decreased if the period of fermentation taking longer.

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LIST OF ABBREVIATIONS

°C	Celcius (Temperature)
HPLC	High Performance Liquid Chromatography
g/L	Concentration
ktoe	Thousand ton of oil equivalent
M	Molarity
mL	Volume
N	Normality
pH	measure acidity in solution
rpm	run per minute
μm	size diameter
w/w	ratio weight

1. INTRODUCTION

1.1 Motivation and statements of problems.

Nowadays, Malaysia had consumed 24 635 thousand ton of oil equivalent (ktoe) of petroleum products in 2012 which the large consume is petrol, 36.2% from total consumption and followed by diesel, 35.6%. In January 2012, Malaysia had produced 584.8 thousand barrels per day, total export of crude oil in 2011 had be dropped since 1990, which was 21 902 ktoe in 1990 to 1 994 ktoe in 2012 and total import of crude oil in Malaysia had increase from 6 031 ktoe in 1990 to 12 725 ktoe in 2012 (Suruhanjaya Tenaga, 2012). This show that crude oil in Malaysia had declined since 1990 and not possible Malaysia will become total importer of crude oil in the future. Figure 1.1 shows the net export of crude oil in Malaysia.

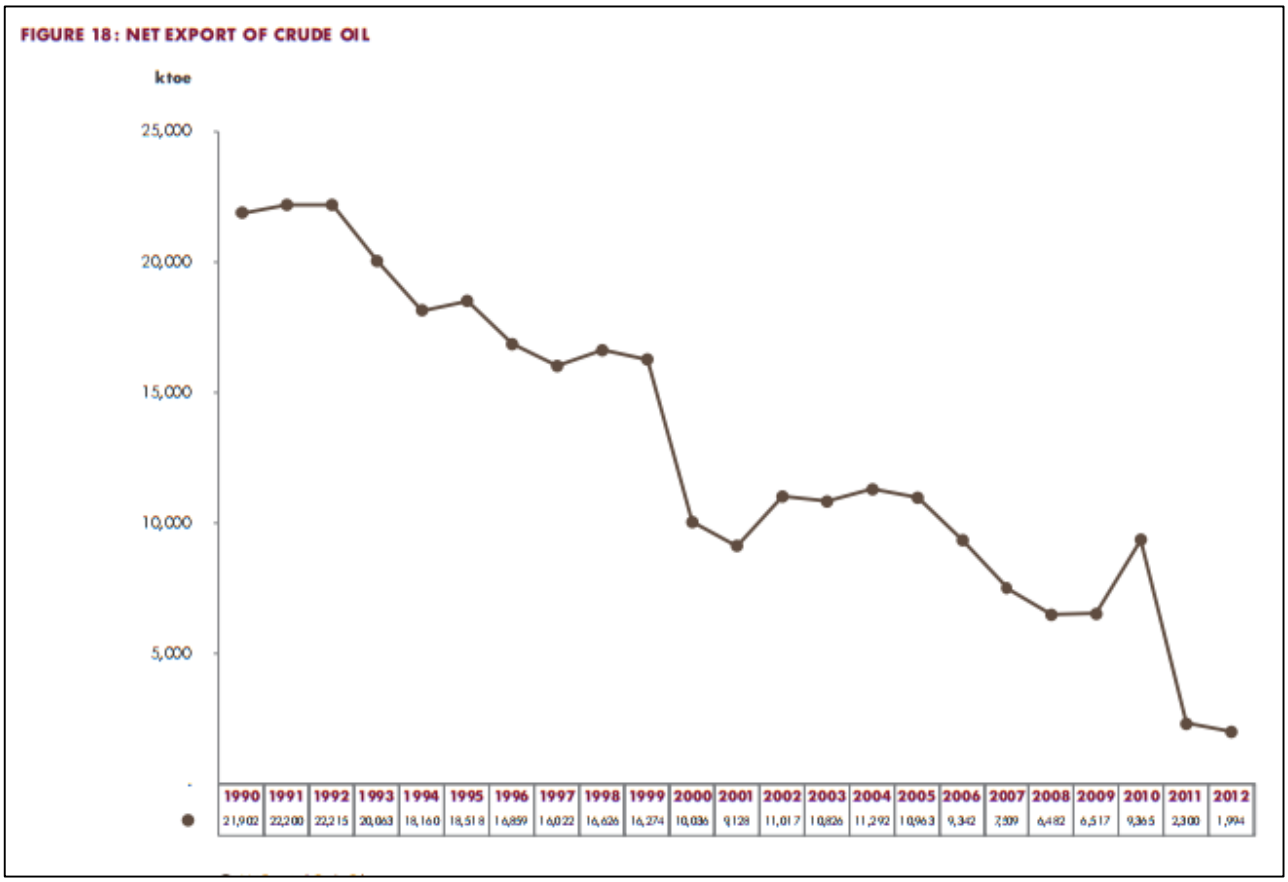

Figure 1.1: Net export of crude oil in Malaysia

Source: Suruhanjaya Tenaga

In recent year, the world petroleum reserves had be declined and the same happened in Malaysia. The world start to find alternative fuel to reduce dependant on the petroleum derived products. The most common study to replace fossil fuels is ethanol derived from plant or waste of agriculture (Kevin, 2006). The ethanol production research had been developed as alternative to petroleum derived products (Prasad, 2007). Ethanol is an alcohol-based fuel produced by fermentation and distillation process by using biomass or plant as raw material (Fuel economy, 2013). Ethanol have a potential to become an alternative fuel in the future and can reduce the dependence on fossil fuel.

The world had utilize the bioethanol production as strategy as vehicle fuel to replace gasoline and reduced the release of carbon and improve the energy feedstock by finding new alternative (Kocoloski et al, 2011). However, the feedstock bioethanol should be from uneatable part of food crops or waste of food in order to prevent food crisis in the future (Sakai et al, 2007). Many organization have started to find new energy strategies and many renewable energy can be utilized. One of new energy to be utilized is biomass from cellulose and it was given high priority than other source of energy and it can be directly utilized for production of various alternative transportation fuel especially ethanol (Dwivedi et al, 2009).

Bioethanol also known as biofuel and is an alcohol produced by fermentation with microorganism and use biomass such as corn, potatoes, wheat and other food waste as sugar source for microorganism. While biodiesel is an oil from plants and has been used in mixture of fossil fuel such as diesel in automobiles and industrial equipment to reduce fully dependent on fossil fuel (Demates, 2013). In 2013, Argentina was leading the most exporters of biodiesel from soy with increasing the exports to U.S. This shows that the world started to focus on biofuel as an alternative energy sources.

In Malaysia, bioethanol research had started is in 1980s and started to commercial to use bioethanol as fuel in 2011 under programme B5 which a blend 5% biodiesel derivation with 95% of fossil fuel and had cover it in central region of peninsular (Choong, 2012). The government had decided to move beyond 5 % of blends in the future but still not effective because the price of crude palm oil need to be stabilized through the increasing of biodiesel

demand (Kotrba & Ron, 2013). From this situation, we need to do finding other plant that have potential to produce ethanol and to reduce dependent fully on palm oil in biodiesel production.

Bioethanol have potential to replace fossil fuel because it is a renewable source and more environmental than fossil fuels. Bioethanol produced by fermentation process with sugar from the plant dried can be used as fuel and it has low carbon dioxide producing and can be a domestic renewable energy sources in the future (Cervero et al, 2010). Bioethanol derived from the plant have issue to disturb the food chain and hunger crisis if plants or vegetable used as feedstock to produce ethanol. In Malaysia, the waste of agriculture such as banana, yum and others have potential to be one of feedstock to bioethanol and this waste do not effect food chain because it is a waste used as energy source. (Abdullah, 2011).

In United States, corn is one of main feedstock for producing ethanol since many years but there was an argument to use food as energy and had led to find another non-food sources (Limayem & Ricke, 2012). In Malaysia, palm oil is used as primary feedstock in producing bioethanol and use bioethanol derivation to become biodiesel. The problem use palm oil as feedstock bioethanol production is to stabilize the price of crude oil. (Kotrba & Ron, 2013). So, lignocellulosic biomass like *Moringa oleifera*, jatropa and neem was utilized to produce ethanol and become a new source in ethanol production (Cheng & Sun, 2002).

Lignocellulosic is a complex matrix, contain a high polysaccharides, proteins and it is also a major essential in most plant in the earth and it consists of 3 major parts which are cellulose, hemicellulose and lignin that contains sugar in the plants (salman & zafar, 2013). The lignocellulosic need to break to release the sugar from the plant cells, then the sugar extracted will be used in fermentation process to produce ethanol. The fermentation process contains microorganisms will convert xylose to ethanol (Lee J. , 1997). The study on lignocellulosic biomass is quiet growing year by year to find the best way to produce ethanol because producing ethanol from lignocellulosic biomass needs high capital cost.

Currently, production of ethanol from lignocellulosic biomass still in small scale production due to lack of technical and obstacles like economic matter to convert lignocellulosic meterials into ethanol (Poonam, 2011). But the research on lignocellulosic as feedstock of ethanol still ongoing and to find the best way in production which is low in cost and suitable for scale up. Many plants can be used as lignocellulosic feedstock such as corn and jatropa and one of plant have possibility to produce ethanol is *Moringa oleifera*.

Moringa oleifera is come from moringacae family and it is called Horseradish or tree of life and it used in many application (Adewale, 2013). *Moringa oleifera* also called "Malunggay" in Philippines, "Kacang Kelur" in Malaysia and "Moringa" in English. It is also popular in Indian community. It called miracle tree because from the root until seed give benefit to human. Leaves, contains high calcium content which is four times higher than calcium in milk, three times the potassium content in banana and four times vitamin A in carrots (Agriculture Bussiness Week, 2008).

In medicinal perspective, all part of *Moringa oleifera* such as root, leave, seed and flower can cure cardiac and circulatory stimulants, antitumor, antipyrectic, anti-inflammatory, untiulcer, cholesterol lowering and more (Farooq, 2007). The root of *Moringa oleife*ra tree can be used to cure gastric ulcers and gastric mucosal lowering the acidity and increasing the pH of gastric juice (Manoj Kumar Choudhary, 2013). The Moringa Oleifera has high therapeutic potential and can prevent of atherosclerosis and cardiovascular diseases for containing hydroalcoholic act as hpolipidemic, anti-inflammatory, antioxidant, anticougalant and platelet antiaggregatory properties (Rajanandh, 2012). This shows that many part of *Moringa oleifera* tree can give benefit to human health.

1.2 Objectives

The following are objectives of this research:

1.1.1 To produce ethanol from *Moringa oleifera* press cake

1.1.2 To measure the yield of ethanol produced at different conditions.

1.2Scope of this research

The following are the scope of this research:

1.2.1 In hydrolysis process, the study will be using different acid concentration such as 2%, 4% and 6%.

1.2.2 The period for fermentation in this research is 3, 5 and 7 days.

1.3 Main Contribute of This Work

The following is the contribution:

- This research work can contribute to find new alternative for produce bioethanol.

1.4Organisation of This Thesis

The structure of the reminder of the thesis is outlined as follow:

Chapter 2 provides an overview of producing ethanol by fermentation from biomasss or cellulose waste. A general description on the pre-treatment, hydrolysis and fermentation of biomass. This chapter also provides a brief review on previous study producing ethanol from different cellulosic materials. A comparison made on all the method used in producing ethanol from *moringa oleifera* press cake.

Chapter 3 gives a review of the procedure involved in producing ethanol from *moringa oleifera* press cake. The method and parameter for this project had been determined. Results has obtained from analysis by using High Performance Liquid Chromotography (HPLC).

Chapter 4 gives a clear understanding of the effect of concentration sulphuric acid during hydrolysis and variety of mass yeast *S.cerevisae* on the concentration of ethanol produced. A brief review of causing and method to increase the yield of ethanol and can be utilized it in the future.

Chapter 5 draws together a summary of the thesis and outlines the future work which might be used for improving this work.

2.0 LITERATURE REVIEW

2.1 Overview

This paper presents the experimental studies on possibility of producing ethanol from *Moringa oleifera* press cake by using fermentation with different concentration of acid through hydrolysis process.

2.2Moringa oleifera press cake

The Moringa Oleifera press cake contains high protein level and can be used as fed to animal. Foidl et al, (2001) stated that press cake after the extraction of seed can be used as food to animal such as rabbit, goats and sheep with mixed diet to replace conventional seed meal which contains high level of amino acids for the animals. So, that means the press cake of *Moringa oleifera* is not waste but residue of exctration oil from the moringa oleifera seed because it still can be used for other purposes. Sumitra et al, (2007) reported that press cake contains high fibre, protein and energy and have potential to be used for production of organic chemicals like ethanol and press cake is offer a wise alternative in production of environmentally friendly biofuel.

Lignicellulosic is important in ethanol production because it is rich with the sugar like xylose and pentose. *Moringa oleifera* press cake consisted of hemicellulose, cellulose and ash that can be used to produce ethanol. According to Martin et al, (2010), the press cake of *Moringa oleifera*, Castor and Jatropha have greater content of hemicellulose than other press cake such as Neem and Candlenut. This means *Moringa Oleifera* press cake has an opportunity to produce ethanol based on composition of press cake. Table 2.1 shows the composition of *Moringa Oleifera* compared to Table 2.1 other crops.

Table 2.1: Comparison of composition Jatropha, Castor, Moringa press cake*

Composition	**Jatropha % w/w**	**Castor, %w/w**	**Moringa,% w/w**
Hemicelluloses	2.3	6.8	3.9
Cellulose	6.1	6.5	5.0
Lignin	1.7	33.8	2.6
Ash	11.7	6.7	6.1

Martin et al. 2010

The press cake consist of lignicellulosic usually contains high sugar contents and it can be converted into ethanol. Gray et al, (2007), stated that cellulose, hemicellulose and lignin can be converted into simple sugars like glucose and pentose to produce ethanol by fermentation process using microorganism. The extracted sugar from cellulose will fed to microorganism as a food to produce ethanol.

2.3 Pre-treatment

Lignincelullosic ethanol production is a complex process compared with extraction of ethanol from grain or sugarcane. It need several method to produce ethanol and it quietly high cost in production. Pre-treatment is needed before hydrolysis process to break the hemicellulose in *Moringe oleifera* press cake. Nathan Mosier et al, 2005 stated that purpose of pre-treatment is to remove structural and compositional obstacles before hydrolysis process for improving yield of ethanol. Pre-treatment will breaks the crystalline structure and expose the cellulose and hemicellulose for easy extraction of sugar during the hydrolysis process.

The pre-treatment of lignocellulosic biomass also have it requirements. According to Parveen Kumar et al, 2009, the following requirements are to enhance the formation of sugars by hydrolysis, reduce the loss of carbohydrates and reduce the formation of byproduct during hydrolysis and fermentation. This requirement must be followed to get highest yield of ethanol from lignocellulosic and if not the yield of ethanol will be low or none. There are two categories can be divided in pre-treatment, physical pre-treatment like steam explosion and chemical pre-treatment such as dilute acid and alkali.

Steam explosion is one of the physical method in pre-treatment of lignocellulosic. Zhengdao Yu et al, 2012 stated that steam explosion is a common and widely method in pre-treatment in lignocellulosic with combination effect of temperature and duration of the pre-treatment. According Parveen et al, 2009, the steam explosion is running in high pressure condition, 0.69-4.83 MPa with high temperature in range 160-260 °C in several seconds to several minutes before the material exposed with atmospheric presssure. This process will effect to hemicellulose to easier break and increasing the possibility of cellulose hydrolysis. However, this method has disadvatage and need to be considered before running this method. According to Mishra et al, (2011), steam explosion method is expensive in term of a capital cost and this method is not economic to be used. So, the alternative method had been developed to reduce the cost of capital and can be used widely.

Recently, pre-treatment with dilute acid is widely used method to replace steam explosion. According to Tutt et al, (2012) stated that pre-treatment with dilute acid is cheap, operating in moderate condition and it easy to implement. Sulphuric acid is most commonly used in acid pre-treatment for lignocellulosic materials. Taherzadeh et al, (2008) stated that acid pre-treatment can be implemented either at high temperature and low acid concentration or low temperature condition and high concentration of acid. However, high concentration of acid is dangerous because it is toxic, hazardous and corrosive.

According to Kumar et al, (2009), there are two types of dilute acid pre-treatment, high temperature above 160°C and low temperature below 160°C. Yang et al, (2012) reported that optimum temperature for acid pre-treatment in order to break hemicellulose is 120°C. Tutt. M., 2012 had reported that dilute acid pre-treatment with sulphuric acid gave high glucose concentration and high yield of ethanol but will produce byproducts and give effect to fermentation process.

Other chemical pre-treatment like acid pre-treatment is alkaline pre-treatment. According to Li et al , (2010), the alkaline pre-treatment can solve the issue in conventional process to produce ethanol involving sugar application. Schenck.et al, (2013) stated that lower lignin content in the hemicellulose is suitable to use alkaline pre-treatment than acid pre-treatment and it can increase efficiency of hydrolysis and fermentation process. Gaa et al, (2013) stated that this pre-treatment can cause disarrangement in cellulose surface to help reacting with the chemical and effective to ruin the structure of cellulose and increase the probability to extract sugar from cellulose.

Mosier, et al., 2005 stated that alkaline pre-treatment can run at ambient conditions but the rate of pre-treatment is taking to long maybe in hours or days. This will taking to long for lignin to remove from hemicellulose. According Kumar et al, 2009, alkaline pre-treatment can reduce sugar degradation and caustic salt can be redeemed compared to acid pre-treatment. Tutt, et al, 2012 stated that alkaline pre-treatment had best fermentation efficiency but lower of glucose produce during hydrolysis causing by hemicellulose still left on the sample and lower the hydrolysis efficiency.

2.4 Hydrolysis

Hydrolysis is process after the pre-treatment of sample had done. Cheng & Sun, (2002) stated that purpose of the hydrolysis is to produce or convert cellulose to sugar. Hydrolysis process run after the pre-treatment. The pre-treatment of cellulose will increase the rate of hydrolysis process and can optimize the ethanol production. According to El-Zawawy et al, (2011), the hydrolysis process for cellulose have two process, which known as an acid hydrolysis and an enzyme hydrolysis.

A common acid use in acid hydrolysis is sulphuric acid. According to Xiang, et al, (2003), acid hydrolysis can be divided by two, dilute acid hydrolysis and concentrated hydrolysis, dilute acid hydrolysis needs high temperature above 200°C to break cellulose structure. According to Esteghlalian et al, (1997), high reaction rates and enhance hydrolysis process can be achieved by dilute acid hydrolysis. Mishra. et al, (2011) stated that dilute acid involve only 1-2 percent of sulphuric acid concentration at high temperature and has reaction time in minutes and seconds and disadvantaged for this dilute acid is the sugar conversion efficiency is only about 50% and overdue at high temperature the sugars is debased before fermentation.

According to Torget, et al, (1990), concentrated acid hydrolysis is common method used and had consider the most suitable method for hydrolysis in production of ethanol by lignocellulosic. Hamelinck et al, (2005) reported that concentrated acid hydrolysis can produce high yield of ethanol but it need large quantities of acid and it is not attractive commercially because the environmental issues. Sun et al, (2011) reported that concentrated acid can run under optimum condition to produce highest efficiency of glucose recovery which was 81.6%. According to Mishra. et al, (2011), the hydrolysis by concentrated acid is usually using concentrated from 40% to 70% and the disadvatages of this method is need separation process to separate the sugar and acid and also need to increase the pH value.

According to El-Zawawy et al, (2011), enzymatic hydrolysis is cellulose of biomass convert to glucose by using cellulose enzyme that is highly specific catalyst. This hydrolysis need to run under mild conditions from 4.5 until 5.0 pH value and at temperature in range 40-50°C. The bacteria and fungi can be used for hydrolysis of lignocellulosic materials. Duff & Murray, (1996) reported that many bacteria such as *Clostridium thermocellum* and *Bacteroides cellulosolvens* can produce cellulose but do not produce high enzyme titres and this bacteria has low growth rate and need aerobic growth conditions and the study start to focus on fungi for commercial cellulose production.

It has several factor that affect enzymatic hydrolysis of cellulose in ethanol production from lignocellulosic. According to Cheng & Sun, (2002) , the factor can affect the enzymatic hydrolysis are substrate concentration, a mount of cellulose during the process and end-product inhibition of cellulose activity. To enhance this method, further study to improve the yield and rate of the enzymatic hydrolysis. However, enzymatic hydrolysis have it advatages compared to acid hydrolysis. El-Zawawy et al, (2011), reported that enzymatic hydrolysis is low corrosion problems, low utility consumption and low toxicity of hydrolyzates.

2.5 Fermentation

Pre-treatment and hydrolysis was developed in this method to maximize the yield of ethanol during fermentation. Fermentation process is involving the microorganism like yeast and fungi. Cheng & Sun, (2002), reported that fungus *T.reesei* and yeast *S.cerevisiae* are always be used by industry to produce ethanol from biomass. Limayem & Ricke, (2012) stated that *S.cerevisiae* have been used widely in alcohol production in wine industries for a decade and it also as main fermentative source for biofuel production. Mishra. et al, (2011) reported that many microorganism can be used in fermentation such as *Saccharomyces cerevisae, Zymomonas mobilis* and *Aspergillus niger* wide used in producing ethanol and can be applied to all major sugar like glucose,xylose,mannose, galactose and arabinose.

According to Hahn-hagerdal et al., (2007), the optimal temperature for microorganisms is approximately 30°C and it can live in 4.0 pH value conditions. Cervero et al, 2010 stated that fermentation of sugar by using *S.cerevisiae* yeast can success without using additional nutrients. According to Lee, (1997), the fermentation process can be affect by several factor such as the particle size of material, moisture contents, aeration, pH value, temperature, incubation time and nutrients addition. Table 2.2 shows the advantages of microorganisms.

Table 2.2: advantages and disadvantages of microorganisms.

Species	Characteristics	Advantages	Disadvantages
Saccharomyces cerevisiae	Facultive , anaerobic yeast	• Naturally adapted to ethanol fermentation • High alcohol yield	• Not able to live in high temperature
Zymomonas mobilis	Gram-negative bacteria	• Ethanol yield surpasses S.cerevisiae • High ethanol tolerance • High ethanol productivity	• Neutral pH range • Low tolerance to inhibitors.

* Limayem & Ricke, 2012

3.0 MATERIALS AND METHODS

3.1Overview

This paper present the materials and method use in this research. It can divided by four process, pre-treatment, hydrolysis, fermentation and distillation. The purpose pre-treatment is to remove all obstacle on cellulose before undergoing hydrolysis process. Hydrolysis process will converting the cellulose into sugar by using sulphuric acid. After all cellulose convert into sugar, the yeast will put into broth for producing ethanol. Ethanol produce will separate from water by simple distillation. The ethanol collected will be analyse by using High Performance Liquid Chromatography (HPLC).

3.1 Chemicals

The chemical use in this research are sulphuric acid and sodium hydroxide. These chemicals can be obtain from Chemical Lab Technical Unit, Universiti Malaysia Pahang.

3.2 Moringa Oleifera Press Cake

The *moringa oleifera* press cake was bought from Mitamosa Sdn Bhd. The press cake was immersed in water for overnight before started the experiment. The oil from press cake was floated at top of water, then the cakes will be filtered from water using sieve and the cake was dried before pre-treatment.

3.3 Pre-treatment

Before pre-treament, the press cake was blended or grinded. The nine samples of 50 g press cake were prepared in conical flask. The pre-treament is using dilute acid sulphuric acid. The powder will be dried at 45°C in 2 hours in the oven. Then, add 0.5% sulphuric acid to break lignincellulose and heat the mixture at temperature 130 °C for 1 hour. After 1 hour, the sample will drying at 35-45°C by using hot air oven.

3.3 Hydrolysis

The press cake will be hydrolysed by different concentration of acid with 2%, 4% and 6% of sulphuric acid. The mixture will be paired in glass bottles and seal it to prevent from vaporization of acid. The mixture will kept at temperature 55°C in 3 days for lignincellulose to release simple sugar.

Figure 3.1: *Moringa oleifera* press cake during hydrolysis.

3.4 Fermentation

The broth will be neutralize before the fermentation. By adding some amount of 4M of Sodium Hydroxide, the mixture need in condition at 4 pH value to allow the yeast growth. After that, the mixture will added in inoculation of yeast with different mass in closed conical flask at temperature at temperature, 32°C with agitation rate 110 rpm in shaker incubator for a week. The yeast to accomplish the fermentation is *saccharomyces cerevisae.* The samples were taken on day 3, day 5 and day 7 during fermenatation stage and were store in vial for analysis.

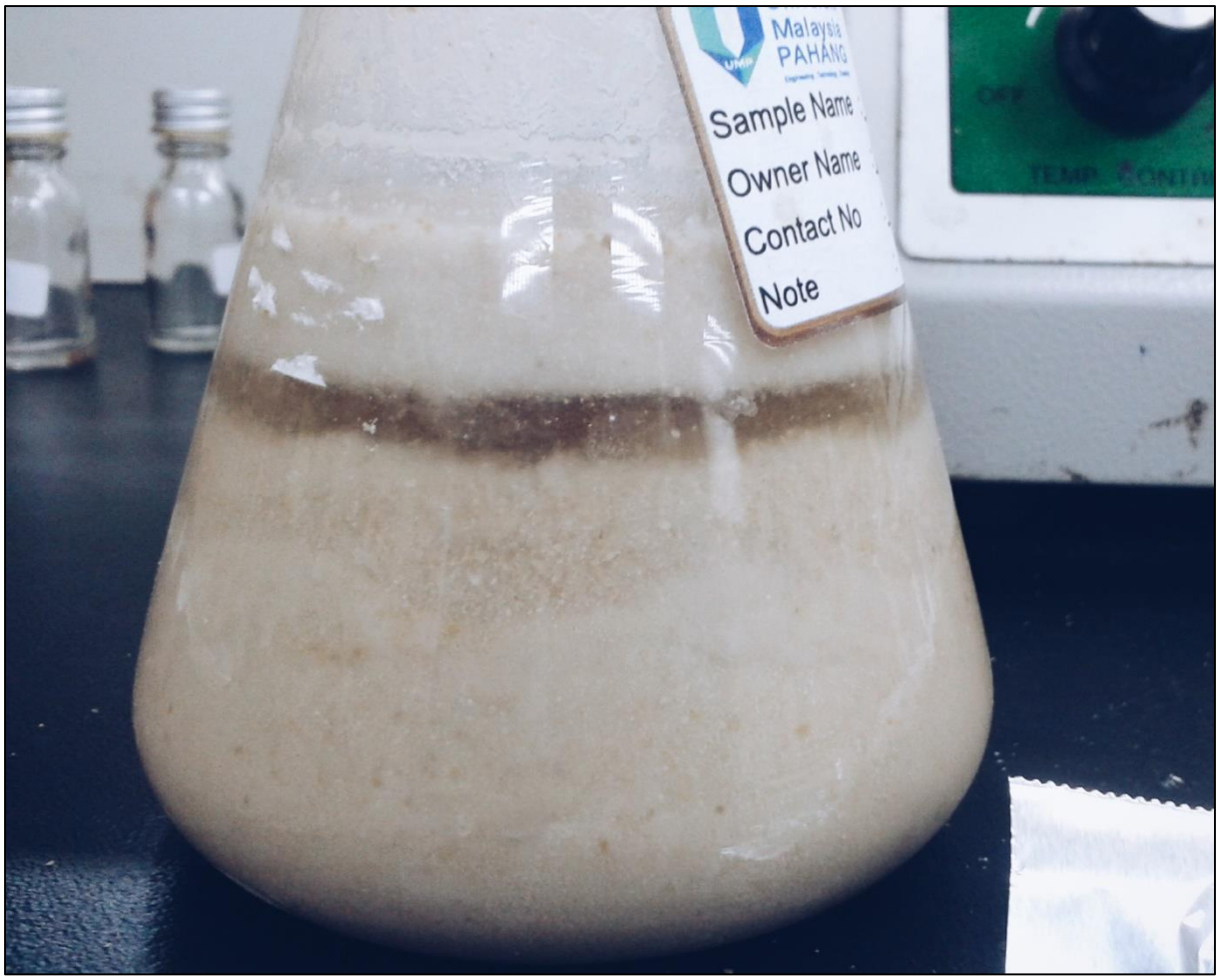

Figure 3.2: Sedimentation after fermentation.

3.5 Analysing the sample

The samples collected were dilute with ratio 1:9, 2 mL of mixture with 18 mL of pure water and filtered with membrane filtered with size 0.02 μm before run on High Performance Liquid Chromotography (HPLC). The mobile phase used was 0.005N of sulphuric acid and used ethanol with 4 different concentration as standard solution such as 4mL/L, 6mL/L, 8mL/L and 10mL/L.

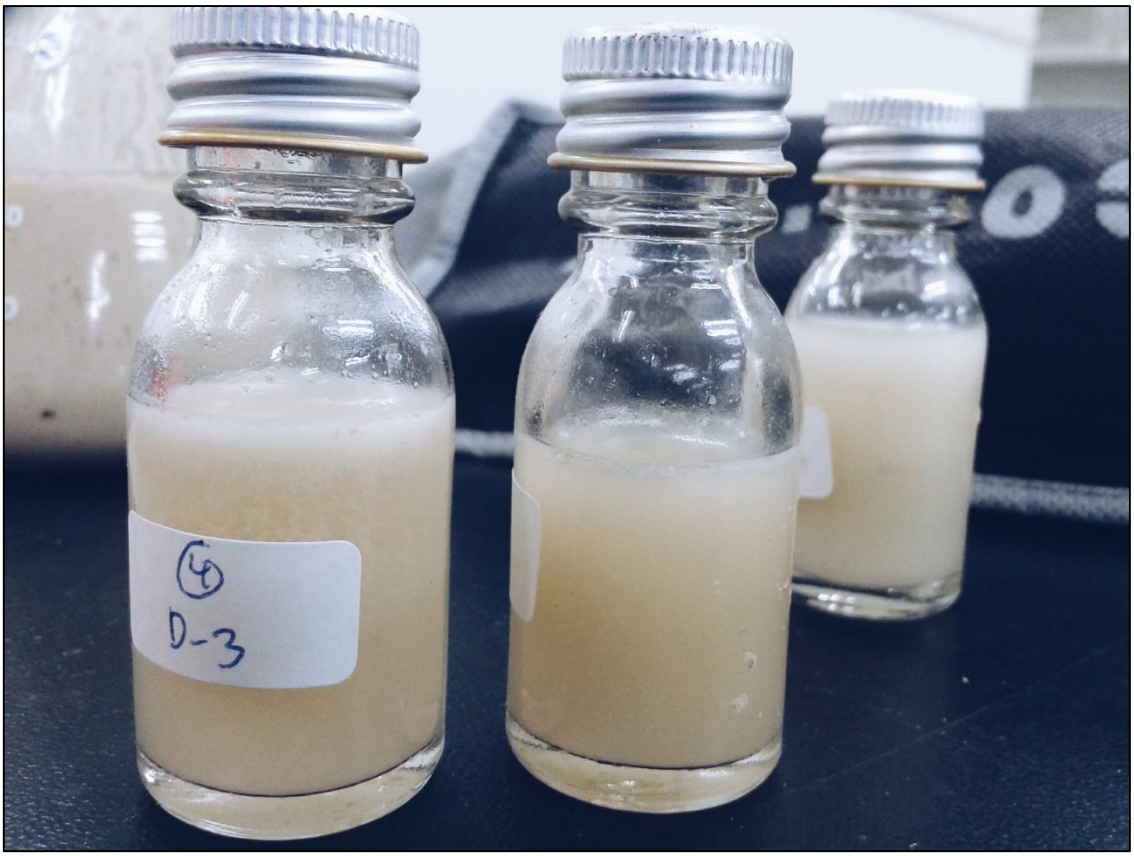

Figure 3.3: Sample before dilution for analysis.

Figure 3.4: Sample after dilution for analysis.

Figure 3.5: Sample after filtration for analysis.

4. RESULTS AND DISCUSSION

4.1 *Overview*

This paper presents a study possibility producing of bioethanol from *moringa oleifera* press cake. Dilute acid pre-treatment and different concentrated acid hydrolysis were performed before fermentation. The hemicellulose from the press cake were converted into sugar and used it as feed to different of mass yeast to produce ethanol. The effect of producing ethanol with different concentration of ethanol was performed by Mishra et.al (2011). The different mass of yeast *S.cerevisiae* was put into sample to study the influence for concentration of ethanol.

4.2 Introduction

This paper presents a concentration of ethanol produced by using different of concentration acid during hydrolysis with 2%, 4% and 6% of sulphuric acid and different of mass yeast for each concentration of acid with 2g, 4g and 6 g of yeast.

4.3 Standard Calibration

The standard of ethanol had prepared by four point such as 4 mL/L, 6 mL/L, 8 mL/L and 10 mL/L. The result for calibration obtained as shown below:

Table 4.1: Standard of ethanol

concentration, mL/L	height,e^4 nano refractive index unit (nRIU)
4	1.278
6	1.609
8	2.057
10	2.944

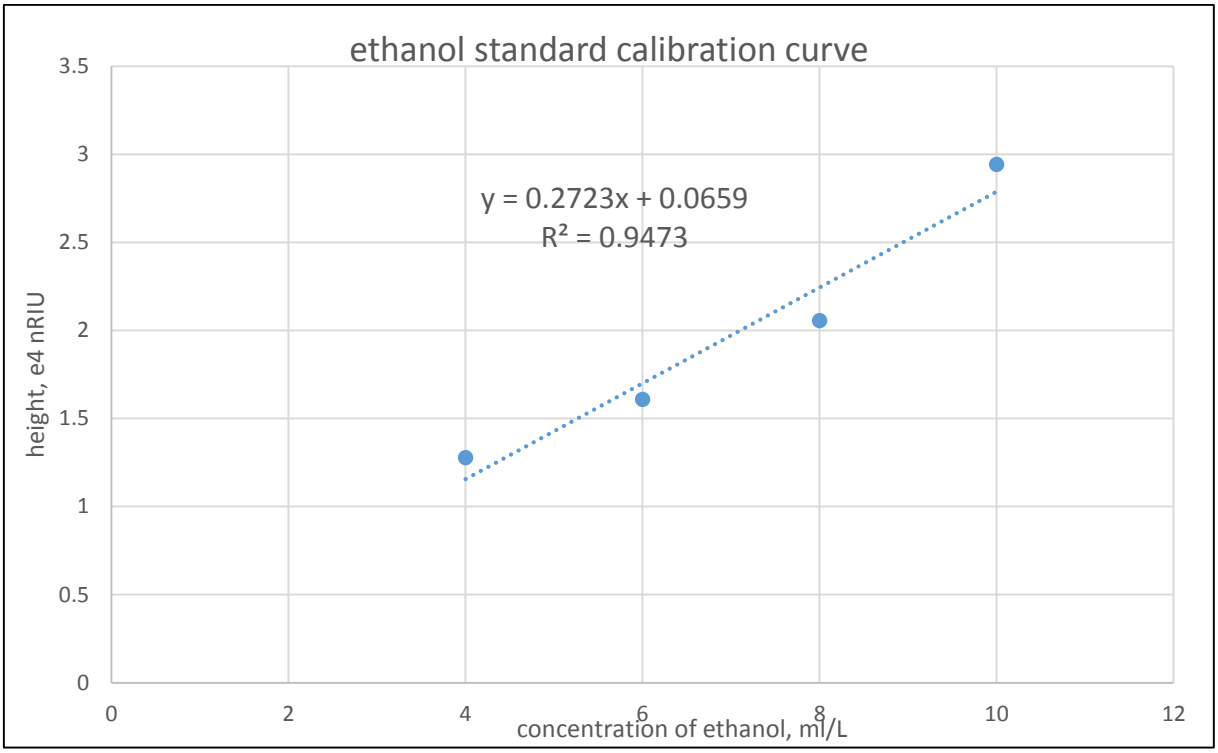

Figure 4.1: ethanol standard calibration curve

From the graph as shown above, the equation is y = 0.2723x + 0.0659 with regression correlation 0.9473. With this equation, the concentration of ethanol can be determined by using that equation.

4.4 Concentration of ethanol

From analysis, the concentration of ethanol produced can be obtained as shown the table below:

Table 4.2: The peak height of the sample from chromatography report.

	Peak height, $X10^4$ nRIU								
concentration of sulphuric acid	2%			4%			6%		
mass of yeast, g	2	4	6	2	4	6	2	4	6
Day 3	0.1212	0.1205	0.1164	0.1037	0.0949	0.0918	0.0857	0.0818	0.0832
Day 5	0.0887	0.0854	0.0751	0.0784	0.0691	0.0607	0.0613	0.0594	0.0594
Day 7	0.0666	0.0623	0.0635	0.057	0.0538	0.0479	0.0449	0.052	0.044

Table 4.3: The concentration of ethanol produced.

	concentration, g/L								
concentration of sulphuric acid	2%			4%			6%		
mass of yeast, g	2g	4g	6g	2g	4g	6g	2g	4g	6g
Day 3	1.6023	1.5821	1.4633	1.0953	0.8403	0.7505	0.5737	0.4607	0.5013
Day 5	0.6606	0.5650	0.2666	0.3622	0.0927	-0.1507	-0.1333	-0.1883	-0.1883
Day 7	0.0203	-0.1043	-0.0695	-0.2579	-0.3506	-0.5216	-0.6085	-0.4028	-0.6346

The results obtained using HPLC with using REDEX-ROA column to analyze the content of ethanol in the samples. The calculation are shown below:

For example:

The concentration of ethanol were determined from calibration curve of standard solution. The concentration of ethanol were determined using the equation:-

$$y = 0.2723x + 0.0659$$

Where, y is peak height

x is concentration of ethanol , (mL/L)

For an average peak height of ethanol in sample 2% of sulphuric acid, 2 g of yeast and day 3 is 0.1212 E-4 nRIU.

$$\text{Concentration} = ((0.1212-0.0659)/0.2723) \times 0.789 \text{ g/mL} \times 10$$

$$= 1.6023 \text{ g/L}$$

4.5 Effect of Concentration acid on Ethanol Production

The sulphuric acid concentration of 2%, 4% and 6%. From different concentration of acid, the result for concentration of ethanol also different. The different concentration of acid were varied during hydrolysis to observe the effect on concentration ethanol produced.

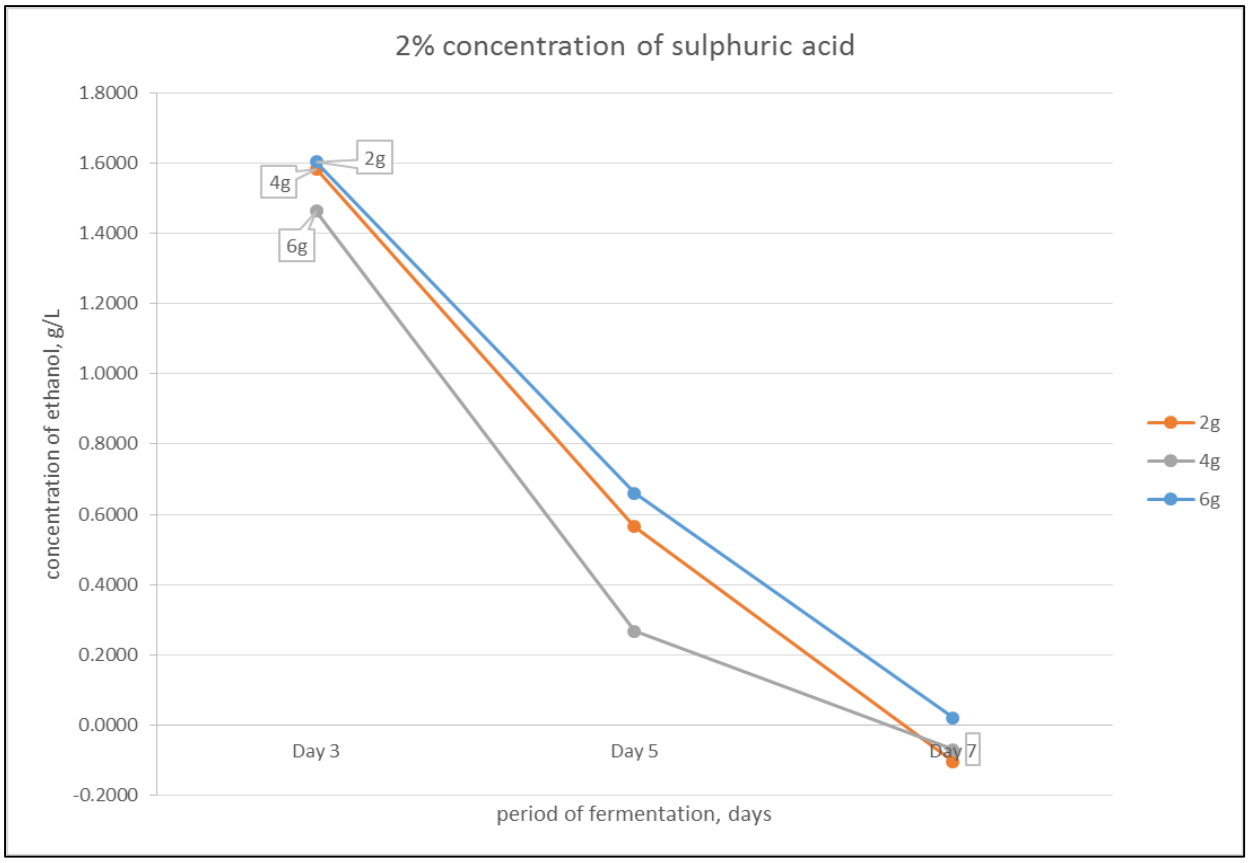

Figure 4.2: Concentration of ethanol produced in 2% of sulphuric acid

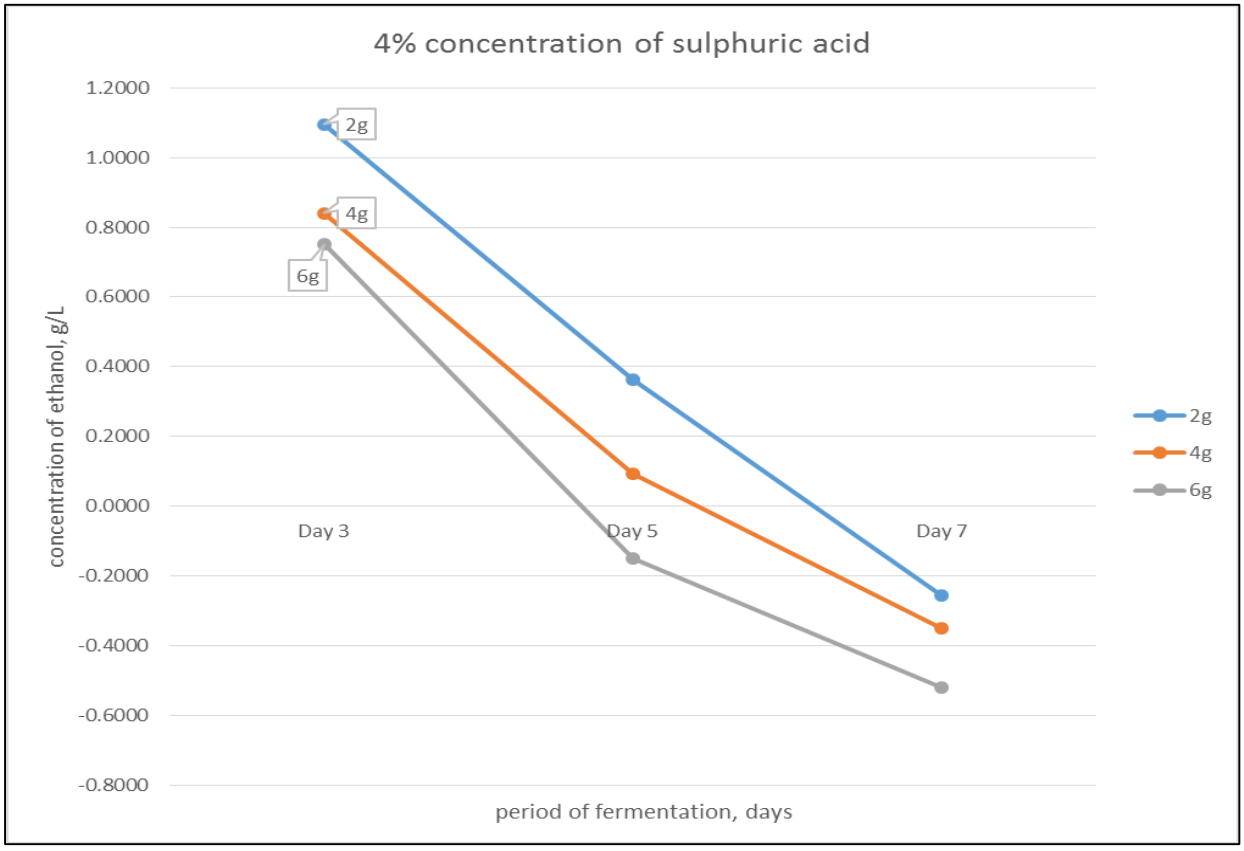

Figure 4.3: Concentration of ethanol produced with 4% of sulphuric acid.

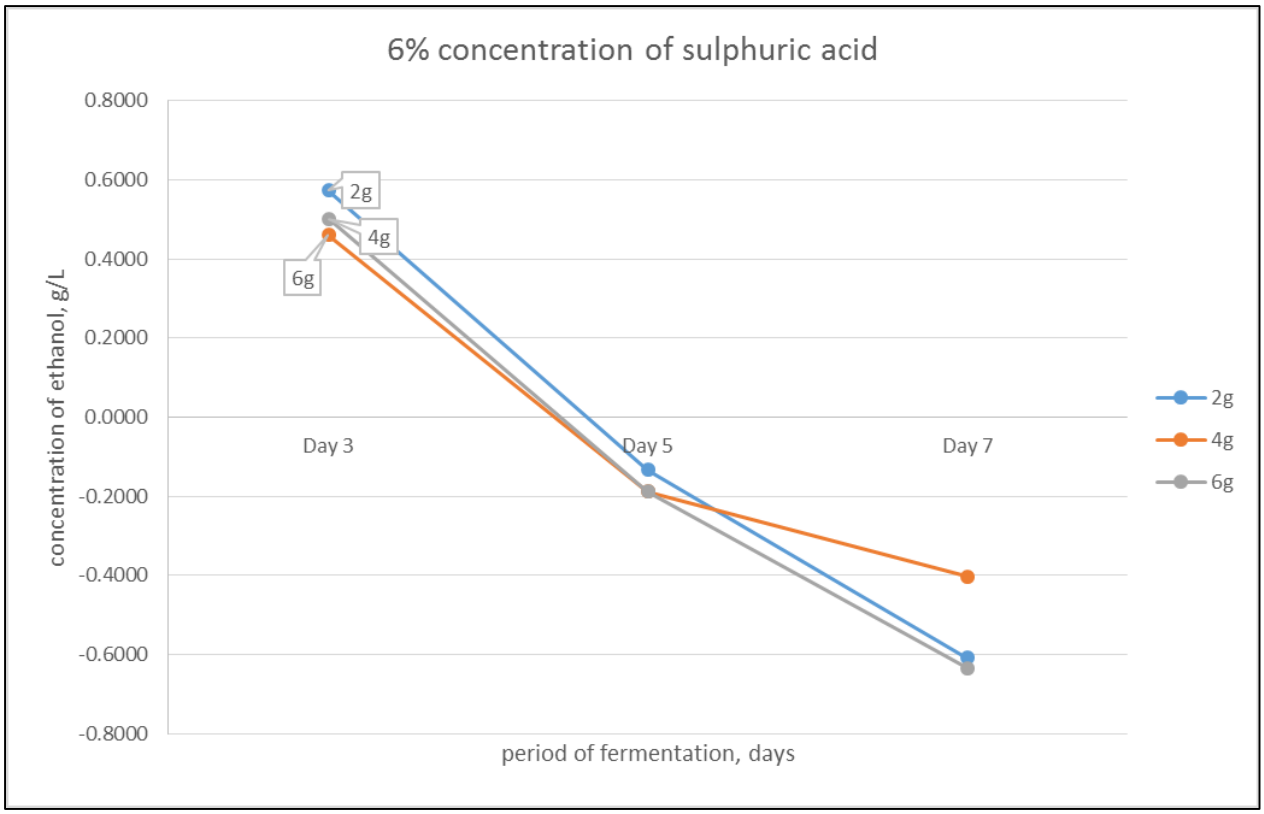

Figure 4.4: Concentration of ethanol produced with 6% of sulphuric acid.

From figure 4.2, 4.3 and 4.4 the ethanol production is decreasing when the period of fermentation is increase. Based on previous study, the amount of ethanol is increase when the period of fermentation until day 7 is increase (Mishra et al. 2011). So, the result obtained is opposite with theory from previous studied.

From the graph, the day 3 of fermentation had highest amount of ethanol yield for each concentration of acid. For 2% sulphuric acid, the ethanol produced was 1.6023 g/L for 2 g of yeast, 1.5821 g/L ethanol for 4 g of yeast and 1.4633 g/L ethanol for 6g of yeast. For day 5, the amount of ethanol was decreased which 0.6606 g/L ethanol for 2 g of yeast, 0.5650 g/L for 4g of yeast and 0.2666 g/L ethanol for 6 g of yeast in same concentration.

For 6% sulphuric acid for day 3, the ethanol produced was 0.5737 g/L for 2 g of yeast and followed by 4g of yeast with 0.4607 g/L ethanol. The 6 g of yeast in same concentration had produced 0.5013 g/L of ethanol. For day 5, the amount of ethanol produced were declined which 0 g/L ethanol for 2g of yeast, 0 g/L ethanol for 4g of yeast and 0 g/L ethanol for 6g of yeast.

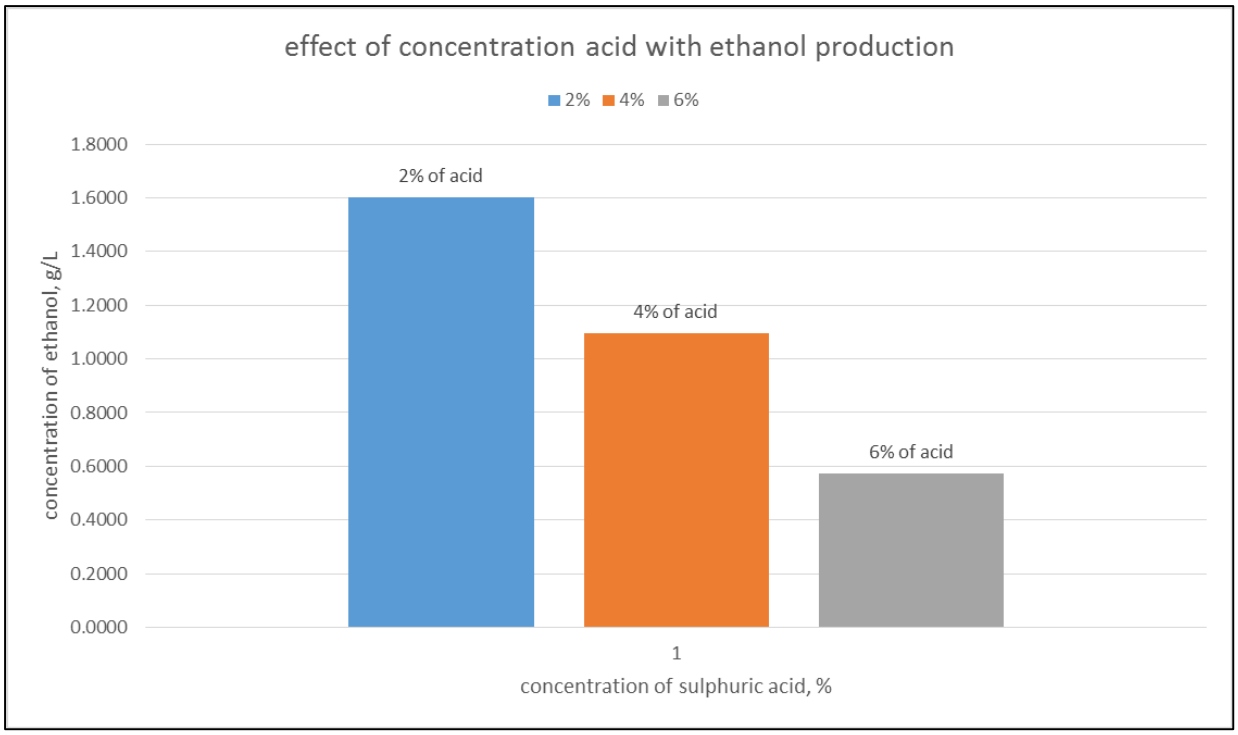

Figure 4.5: Comparison of different concentration acid with ethanol production

The figure 4.5 represent the amount of ethanol produced on day 3 with different concentration of acid. From the graph, the lowest concentration of acid was produced high concentration of acid which 2% of sulphuric acid during hydrolyzed was produced 1.6023 g/L of ethanol. The highest concentrated acid was produced the lowest concentration of ethanol which 6% of sulphuric acid was produced only 0.5737 g/L of ethanol. This show that, the lower concentration of acid will produce the highest yield of ethanol.

Based on previous studies, the increased concentration of acid was caused the hemicellulose converted into sugar was increased and amount of sugar release was increased and the ethanol produced from the fermentation also increased (Mishra et al. 2011). But the result shown was opposite, the increasing concentration of acid during hydrolyzed, the ethanol produced by yeast were decreased.

Based on previous studies, the increasing concentration of acid were effect on yeast productivity to produce ethanol. The ethanol productivity is decrease when the high concentration of acid is used and low concentration of acid will not lower the productivity of ethanol by yeast (Zhang et al. 2012). In this studies was proof that the increasing concentration of acid was lower the production of ethanol and lower the productivity.

The extended fermentation time was make the yeast to pump out excess protons to produce the required pH for growth and active fermentation. Due to high concentrated acid and the longer time for fermentation, it have potential medium pH to decline below 4.2 and caused the growth of yeast was retarded. When the yeast was retarded, the production of ethanol also decline and it unacceptable in industrial scale.

4.6 Effect of Mass of yeast S.Cerevisiae on Concentration of Ethanol.

The mass used for this studied are 2 g, 4 g and 6 g of yeast *S.cerevisiae* into the sample to see the relationship between mass of yeast on ethanol production. The different mass of yeast were put into different concentration of acid sample. The relationship can be seen as followed:

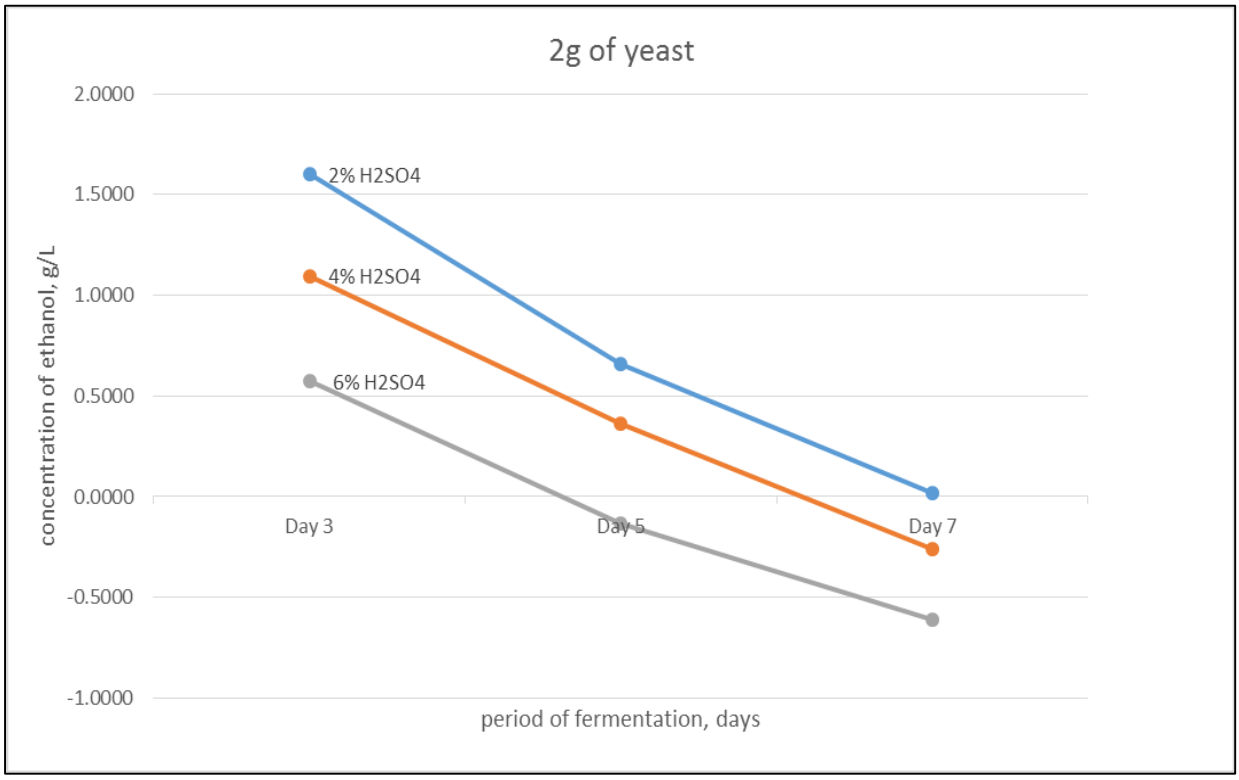

Figure 4.6: Concentration of ethanol with different concentration of acid in 2 g of yeast.

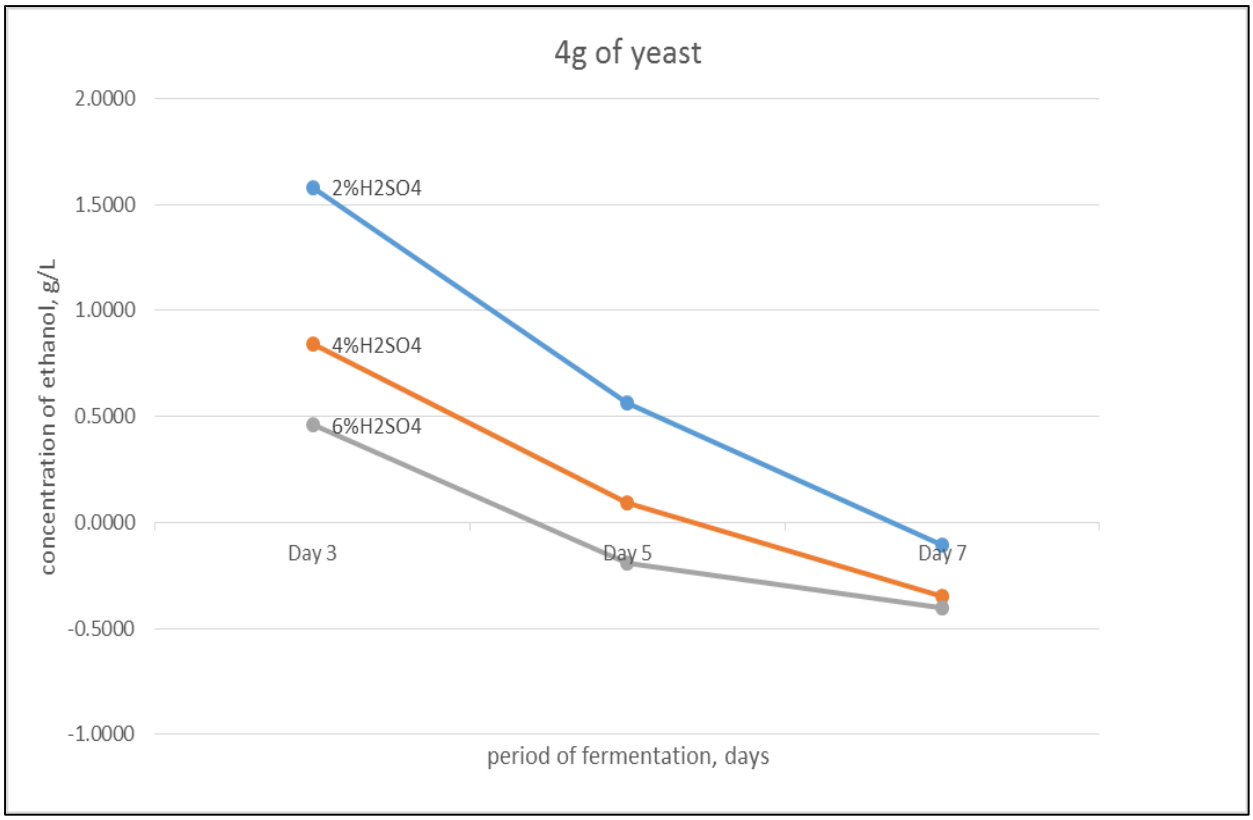

Figure 4.7: Concentration of ethanol with different concentration of acid in 4 g of yeast.

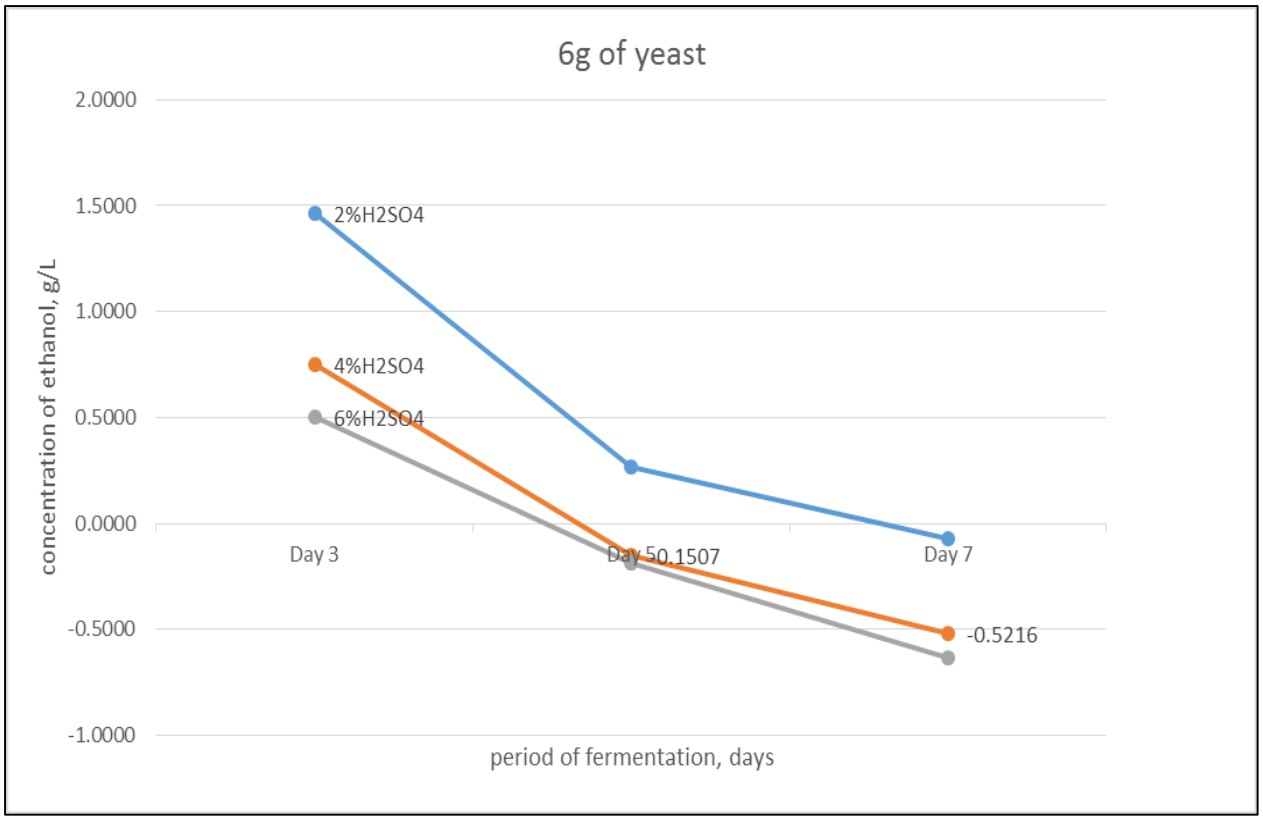

Figure 4.8: Concentration of ethanol with different concentration of acid in 6 g of yeast.

From the figure 4.6, 4.7 and 4.8 above, for 2g of yeast were produced 1.6023 g/L ethanol for 2% sulphuric acid, 1.0953 g/L ethanol for 4% sulphuric acid and 0.5737 g/L ethanol for 6% sulphuric acid on day 3 of fermentation. For day 5 of fermentation, the yield of ethanol were 0.6606 g/L ethanol for 2% sulphuric acid, 0.3622 g/L ethanol for 4% sulphuric acid and -0.1333 g/L ethanol for 6% sulphuric acid. The result show, amount of ethanol was decreasing due to period of fermentation in varied of mass yeast used.

For 6g of yeast, the largest amount of yeast used was produced 1.4633 g/L ethanol in 2% sulphuric acid for hydrolyzed on day 3 of fermentation. While 4% sulphuric acid, the amount of ethanol produced was 0.7505 g/L and for 6% sulphuric acid was produced 0.5013 g/L ethanol on the same day. However, for day 5 the yield of ethanol was declined and the yield ethanol for 2% sulphuric acid was 0.2666 g/L, for 4% sulphuric acid was 0 g/L and for the highest concentration of acid was produced 0 g/L of ethanol. The result show that amount of ethanol produced was declined during day 5 in fermentation stage.

So, the concentration of ethanol is decline due to period of fermentation. That means the long period of fermentation take place, the concentration of ethanol also decrease. So, the relationship mass of yeast with period of fermentation were gave the result that the longer period of time will not give desire high concentration of ethanol. The small amount of yeast was slow down the concentration of ethanol reduction.

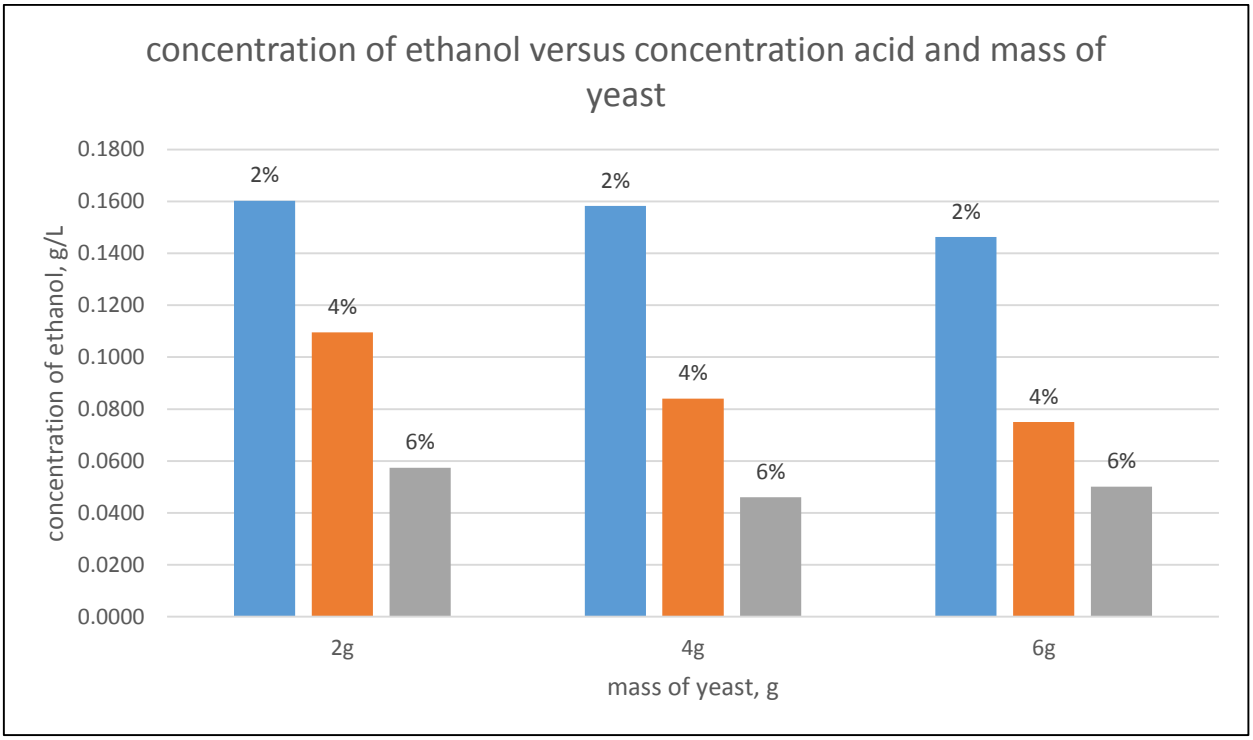

Figure 4.9: Yield of ethanol from different concentration acid and mass of yeast on day 3.

From the graph above, the increasing mass of yeast was declined the ethanol yield. The small amount of yeast used was 2 g of *S.cerevisiae* and was produced only 1.6023g/L of ethanol in 2% of concentration sulphuric acid during hydrolyzed. The largest amount of yeast used was 6 g of *S.cerevisae* and was produced 1.4633 g/L of ethanol in the same concentration of acid which 2% of sulphuric acid.

For 4% concentration of sulphuric acid, the 2g of yeast was produced 1.0953 g/L of ethanol, for 4g of yeast was produced 0.8403 g/L of ethanol and for 6g of yeast was produced only 0.7505 g/L of ethanol. So, the increasing the mass of yeast in moderate concentration of sulphuric acid was declined the ethanol concentration of yeast.

For 6% concentration of sulphuric acid, the 2g of yeast was produced only 0.5737 g/L of ethanol and followed by 4 g of yeast can produce only 0.4607 g/L of ethanol. For the high amount of yeast, 6g can produce only 0.5013 g/L of ethanol. If compared with 2% of sulphuric acid with different mass of yeast, the trend for yield of ethanol were decreasing or declined. So, that show the increasing the mass is not giving the high concentration of ethanol but the small amount of yeast can produce high yield of ethanol and more economic.

5.0 CONCLUSION

5.1 Conclusion

This study was focused on possibility of *Moringa oleifera* press cake to produce ethanol with different concentration of acid during hydrolysis such as 2%, 4% and 6% with different of mass yeast *S.cerevisiae*. With lowest of concentration of acid during hydrolysis can produce high yield of ethanol compared with high concentration of ethanol. The mass of yeast is not giving high production of ethanol but with smallest amount of yeast it can produce high concentration of ethanol. So, it can be concluded that *Moringa oleifera* press cake is possible to produce ethanol and has potential to become feedstock to bioethanol production.

5.2 Future Work

For the future work to improve this study, it must give focus on the pH of broth before doing the fermentation. The suggestion for pH is 5.5 because to avoid the pH drop below 4.2 where the yeast growth is retard during fermentation and give effect to yield of ethanol. The further research also can be done for 24 hour, 48 hour and 72 hour fermentation.

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Yu, Z., Zhang, B., Yu, F., Xu, G., & Song, A. (2012). A real explosion: The requirement of steam explosion pre-treatment. *Bioresourcee Technology*, 335-341.

APPENDIX

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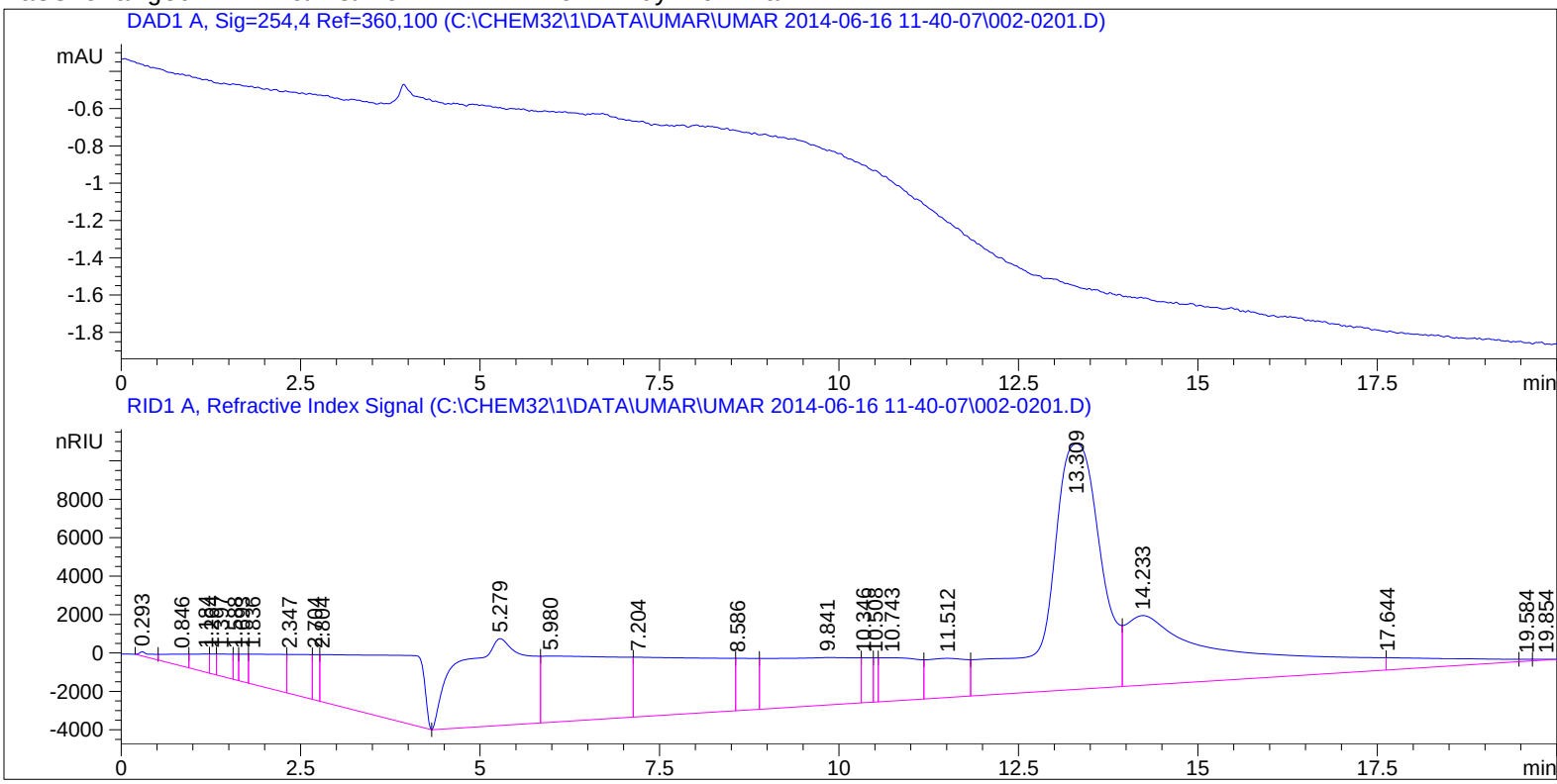


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Signal 2: RID1 A, Refractive Index Signal

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----|-------|----|-------|----------|----------|--------|
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   2   0.846 VV    0.2491 1.29903e4   619.17316   0.4637
   3   1.184 VV    0.1877 1.47333e4   948.45520   0.5259
   4   1.264 VV    0.0755 6059.90479 1023.80756   0.2163
   5   1.397 VV    0.1867 1.64995e4  1151.05518   0.5889
   6   1.588 VV    0.0602 6357.91357 1327.82996   0.2269
   7   1.693 VV    0.1030 1.18254e4  1428.83728   0.4221
   8   1.836 VV    0.4289 5.60505e4  1564.10583   2.0006
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12	5.279	VV	0.8528	3.07606e5	4516.90332	10.9793
13	5.980	VV	0.8770	2.56012e5	3448.21460	9.1378
14	7.204	VV	0.9479	2.49740e5	3101.92456	8.9139
15	8.586	VV	0.2438	5.33745e4	2723.00415	1.9051
16	9.841	VV	1.0239	2.12809e5	2471.74756	7.5958
17	10.346	VV	0.1265	2.35784e4	2334.30127	0.8416
18	10.508	VV	0.0543	9414.96582	2295.50220	0.3360
19	10.743	VV	0.4555	8.34590e4	2244.26880	2.9789
20	11.512	VV	0.5407	7.81713e4	2036.65369	2.7902
21	13.309	VV	0.7751	6.59850e5	1.27815e4	23.5519
22	14.233	VV	1.2728	3.60895e5	3628.29150	12.8814
23	17.644	VV	0.7751	4.19753e4	635.38464	1.4982
24	19.584	VV	0.1401	1165.88000	100.19880	0.0416
25	19.854	VBA	0.2643	894.85114	41.89690	0.0319
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*** End of Report ***

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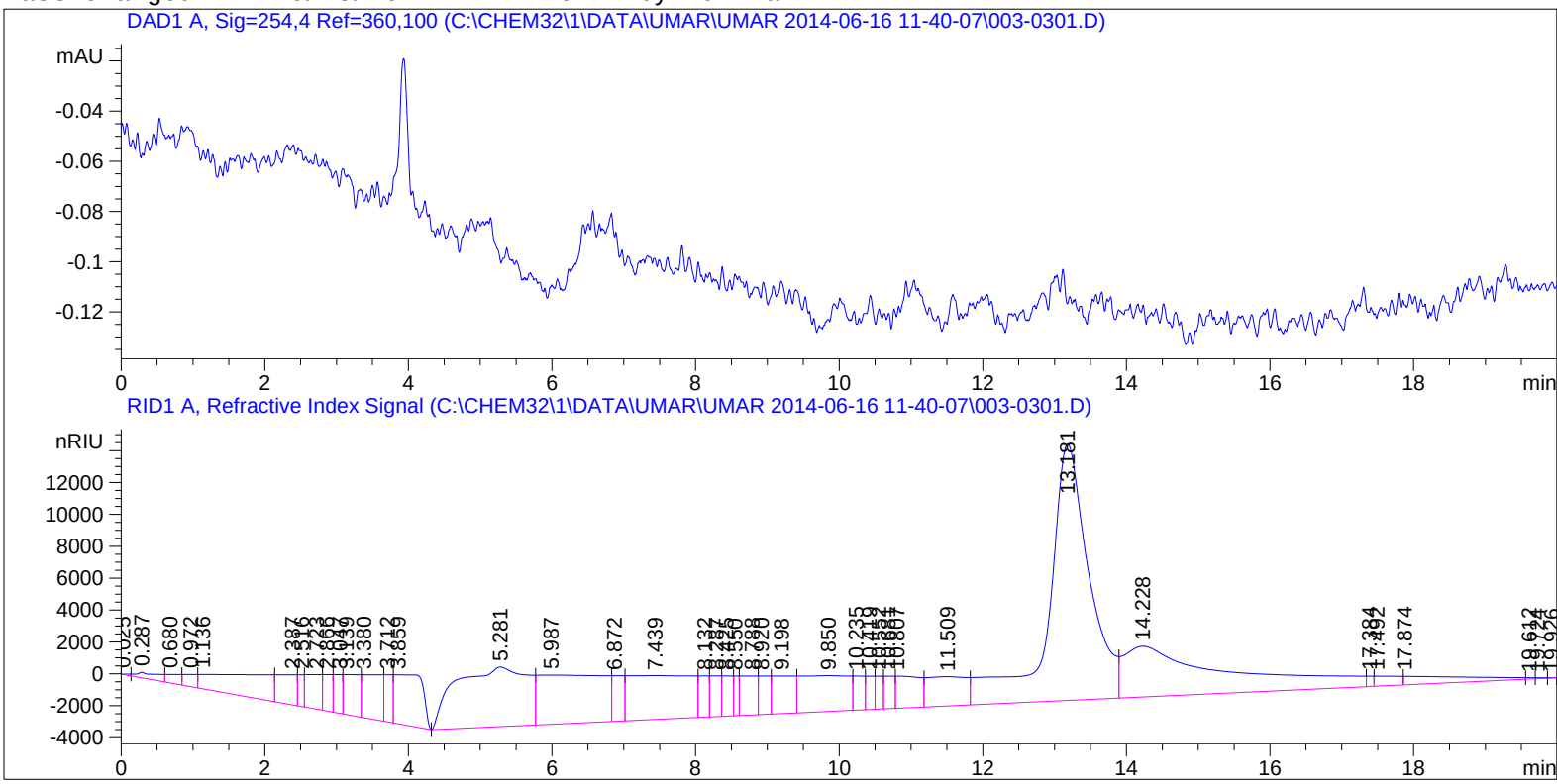


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==========================================================================
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==========================================================================

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Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100


Signal 2: RID1 A, Refractive Index Signal
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3	0.680	VV	0.1843	8120.26660	532.81458	0.3156
4	0.972	VV	0.1562	9994.95410	767.61334	0.3885
5	1.136	VV	1.0616	8.12789e4	900.59497	3.1590
6	2.387	VV	0.2194	3.45482e4	1892.72314	1.3428
7	2.516	VV	0.0806	1.15884e4	1997.53760	0.4504
8	2.723	VV	0.1841	3.22181e4	2168.45508	1.2522
9	2.866	VV	0.1189	2.03048e4	2283.41162	0.7892

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\003-0301.D
Sample Name: c

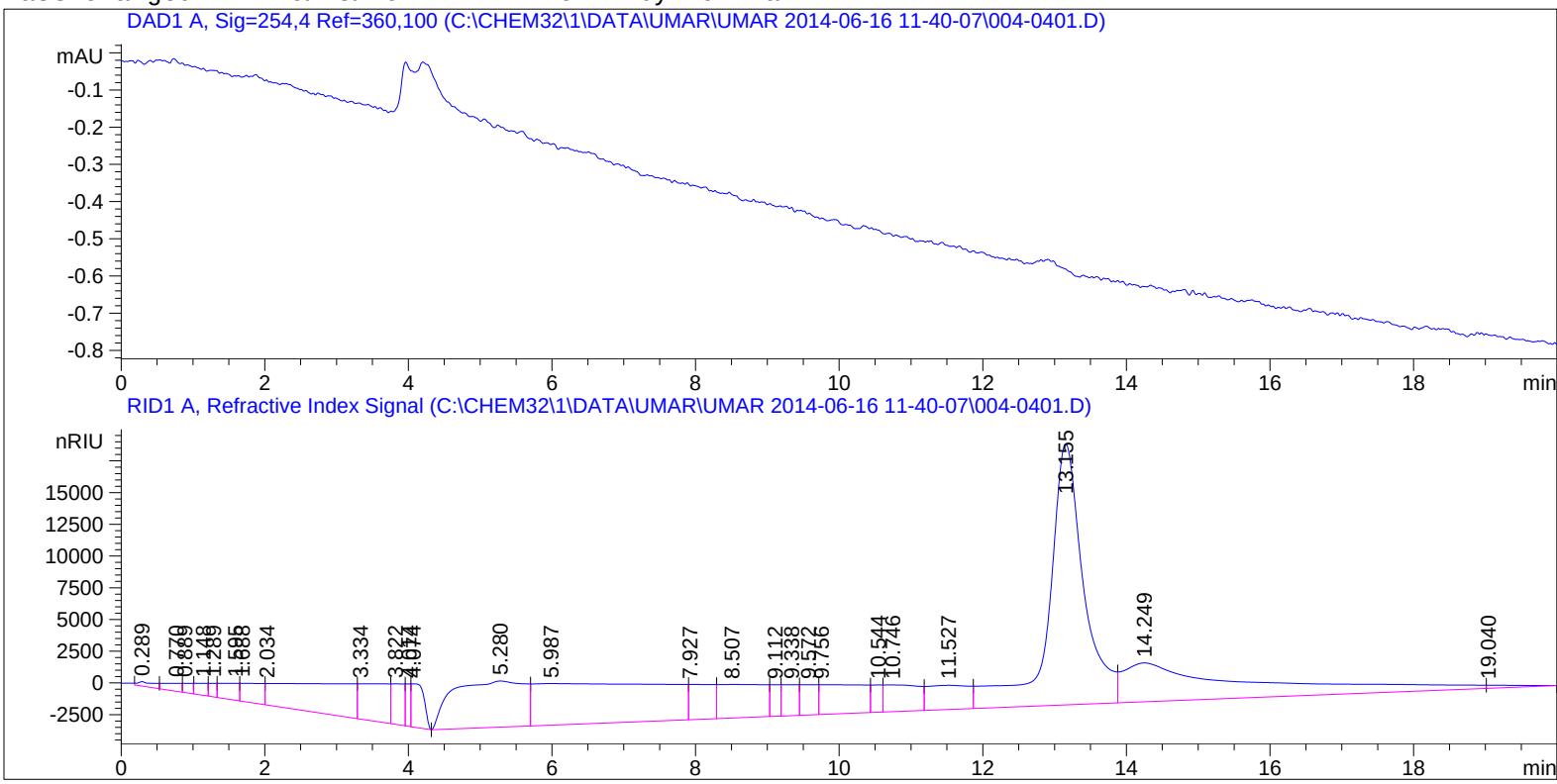
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
10	3.047	VV	0.1035	1.97580e4	2428.92603	0.7679
11	3.139	VV	0.1919	3.93243e4	2503.83447	1.5284
12	3.380	VV	0.2321	5.26019e4	2694.07349	2.0444
13	3.712	VV	0.0992	2.34841e4	2954.95532	0.9127
14	3.859	VV	0.3290	8.49808e4	3073.57568	3.3029
15	5.281	VV	0.8678	2.58383e5	3733.96997	10.0424
16	5.987	VV	0.7291	1.90557e5	3085.89893	7.4062
17	6.872	VV	0.1353	3.15690e4	2858.39648	1.2270
18	7.439	VV	0.7261	1.66383e5	2755.26929	6.4667
19	8.132	VV	0.1231	2.43998e4	2583.51440	0.9483
20	8.287	VV	0.1344	2.61085e4	2552.91187	1.0147
21	8.425	VV	0.1329	2.50095e4	2523.38208	0.9720
22	8.550	VV	0.0618	1.18268e4	2492.79956	0.4597
23	8.788	VV	0.1915	3.92388e4	2446.21826	1.5251
24	8.920	VV	0.1448	2.59830e4	2418.34375	1.0099
25	9.198	VV	0.2551	5.01599e4	2353.54468	1.9495
26	9.850	VV	0.5665	1.04948e5	2246.90479	4.0789
27	10.235	VV	0.1355	2.20530e4	2138.01123	0.8571
28	10.419	VV	0.1026	1.68688e4	2094.91406	0.6556
29	10.552	VV	0.0887	1.45692e4	2066.50513	0.5663
30	10.681	VV	0.1286	2.02217e4	2039.24011	0.7859
31	10.807	VV	0.3848	4.64694e4	2012.66760	1.8061
32	11.509	VV	0.4898	6.98748e4	1834.33398	2.7158
33	13.181	VV	0.5559	6.35695e5	1.60926e4	24.7071
34	14.228	VV	1.2675	3.13268e5	3181.65112	12.1756
35	17.384	VV	0.0818	4160.32080	644.56055	0.1617
36	17.492	VV	0.2786	1.42703e4	621.62683	0.5546
37	17.874	VV	0.7099	3.21771e4	532.00946	1.2506
38	19.612	VV	0.1091	659.66418	85.79906	0.0256
39	19.724	VV	0.1080	486.46417	59.72368	0.0189
40	19.926	VBA	0.0933	113.36963	15.62248	4.406e-3
Totals :				2.57292e6	9.00363e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\004-0401.D
Sample Name: d

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :   4
Acq. Instrument : Instrument 1                   Location : Vial 4
Injection Date  : 6/16/2014 12:48:48 PM               Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100


Signal 2: RID1 A, Refractive Index Signal

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  [nRIU*s]    [nRIU]       %
----|-------|----|-------|----------|----------|--------|
   1   0.289 BV    0.2331 6428.99756  351.07220   0.2357
   2   0.770 VV    0.2147 1.06750e4   623.93671   0.3913
   3   0.889 VB    0.1201 7051.36816  724.02301   0.2585
   4   1.148 BV    0.1451 1.10603e4   945.54303   0.4054
   5   1.289 VV    0.0955 7736.10986 1066.09680   0.2836
   6   1.595 VV    0.2137 2.36211e4  1330.03967   0.8659
   7   1.688 VV    0.2738 3.22951e4  1409.48059   1.1838
   8   2.034 VV    1.1741 1.70028e5  1695.76306   6.2326
   9   3.334 VV    0.3568 8.18161e4  2776.15356   2.9991
```

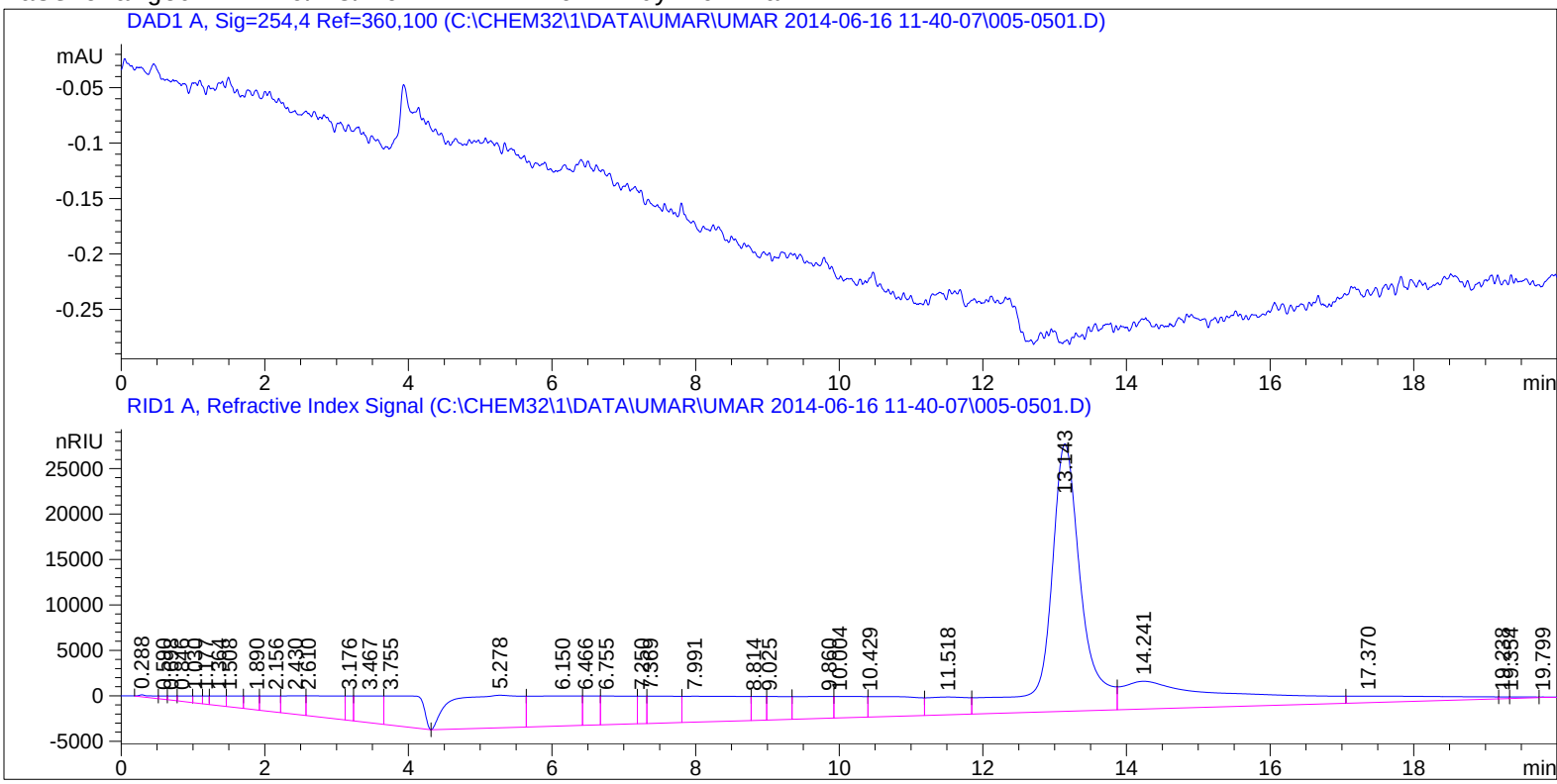
Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\004-0401.D
Sample Name: d

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
10	3.822	VV	0.1510	3.89358e4	3191.00732	1.4273
11	4.014	VV	0.0617	1.58662e4	3354.41626	0.5816
12	4.074	VV	0.1985	4.15474e4	3405.57422	1.5230
13	5.280	VV	0.8808	2.54068e5	3632.35425	9.3132
14	5.987	VV	1.4453	4.03317e5	3275.10889	14.7842
15	7.927	VV	0.3851	6.40147e4	2770.65356	2.3466
16	8.507	VV	0.5221	1.15155e5	2638.47168	4.2212
17	9.112	VV	0.1195	2.36453e4	2489.00220	0.8668
18	9.338	VV	0.1929	3.76201e4	2438.53491	1.3790
19	9.572	VV	0.1923	3.84169e4	2384.57788	1.4082
20	9.756	VV	0.5038	9.77070e4	2342.98828	3.5816
21	10.544	VV	0.1341	2.23222e4	2149.15161	0.8183
22	10.746	VV	0.4063	7.01751e4	2104.45435	2.5724
23	11.527	VV	0.5514	7.66966e4	1906.69141	2.8114
24	13.155	VV	0.4901	7.04346e5	2.05747e4	25.8189
25	14.249	VV	1.5179	3.66092e5	3066.91040	13.4197
26	19.040	VBA	0.3690	7389.89258	243.63600	0.2709
Totals :				2.72803e6	7.28903e4	

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\005-0501.D
Sample Name: e

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :   5
Acq. Instrument : Instrument 1                   Location : Vial 5
Injection Date  : 6/16/2014 1:11:10 PM                Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100


Signal 2: RID1 A, Refractive Index Signal

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  [nRIU*s]    [nRIU]       %
----|-------|----|-------|----------|----------|--------|
   1   0.288 BV    0.2096 3606.55103  221.31654   0.1214
   2   0.590 VV    0.0933 2703.41943  363.22449   0.0910
   3   0.698 VV    0.1113 3885.18628  461.10092   0.1308
   4   0.846 VV    0.1674 8185.51807  593.32263   0.2755
   5   1.030 VV    0.1062 6480.80518  757.85730   0.2181
   6   1.177 VV    0.0722 5012.79932  889.45905   0.1687
   7   1.364 VV    0.1787 1.48526e4  1059.05981   0.4999
   8   1.508 VV    0.1886 1.78654e4  1186.88550   0.6013
   9   1.890 VV    0.1556 1.95697e4  1531.27161   0.6586
```

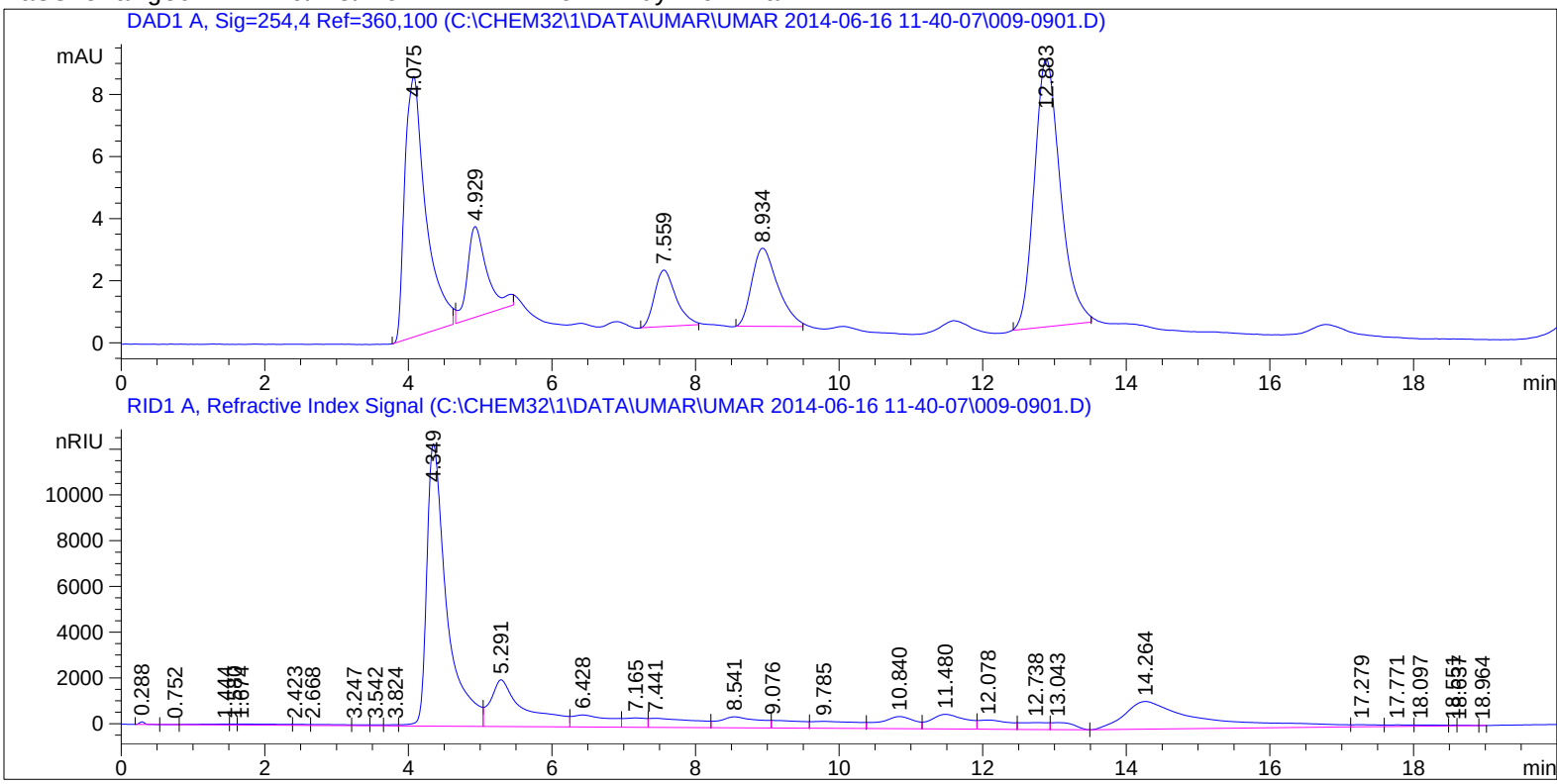
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
10	2.156	VV	0.2149	3.01172e4	1777.79041	1.0136
11	2.430	VV	0.2518	4.23028e4	2029.95374	1.4237
12	2.610	VV	0.4240	7.84046e4	2191.00122	2.6387
13	3.176	VV	0.0889	1.90108e4	2690.29517	0.6398
14	3.467	VV	0.3015	7.42071e4	2956.38184	2.4975
15	3.755	VV	0.4457	1.16193e5	3212.35937	3.9105
16	5.278	VV	0.8582	2.46694e5	3578.67554	8.3026
17	6.150	VV	0.5672	1.56200e5	3300.58911	5.2570
18	6.466	VV	0.1835	4.77094e4	3222.61987	1.6057
19	6.755	VV	0.3616	9.59827e4	3153.60815	3.2303
20	7.250	VV	0.1061	2.41927e4	3028.94141	0.8142
21	7.369	VV	0.3474	8.60035e4	3000.36792	2.8945
22	7.991	VV	0.6738	1.60323e5	2849.19775	5.3958
23	8.814	VV	0.1610	3.39076e4	2634.39209	1.1412
24	9.025	VV	0.2650	5.38349e4	2580.57275	1.8118
25	9.860	VV	0.4308	8.53637e4	2395.60156	2.8730
26	10.004	VV	0.3310	6.61644e4	2363.19727	2.2268
27	10.429	VV	0.5288	1.00767e5	2250.88110	3.3914
28	11.518	VV	0.5384	7.53104e4	1952.98413	2.5346
29	13.143	VV	0.4541	9.11541e5	2.94397e4	30.6784
30	14.241	VV	1.3140	3.15474e5	3062.70679	10.6174
31	17.370	VV	1.0611	6.42400e4	712.09485	2.1620
32	19.238	VV	0.1177	1743.63171	198.31355	0.0587
33	19.354	VV	0.2096	2943.94507	169.11320	0.0991
34	19.799	VBA	0.1231	486.79626	52.59164	0.0164
Totals :				2.97128e6	9.18675e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\009-0901.D
Sample Name: D1-1

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :   9
Acq. Instrument : Instrument 1                   Location : Vial 9
Injection Date  : 6/16/2014 2:40:40 PM               Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.075 BB    0.3007  170.34328    8.39610  31.3171
   2   4.929 BB    0.2807   56.26516    2.92182  10.3442
   3   7.559 BB    0.3119   37.38140    1.81786   6.8725
   4   8.934 BB    0.3744   63.04581    2.51566  11.5908
   5  12.883 BB    0.3849  216.89508    8.63782  39.8755

Totals :                   543.93073   24.28926
```

Signal 2: RID1 A, Refractive Index Signal

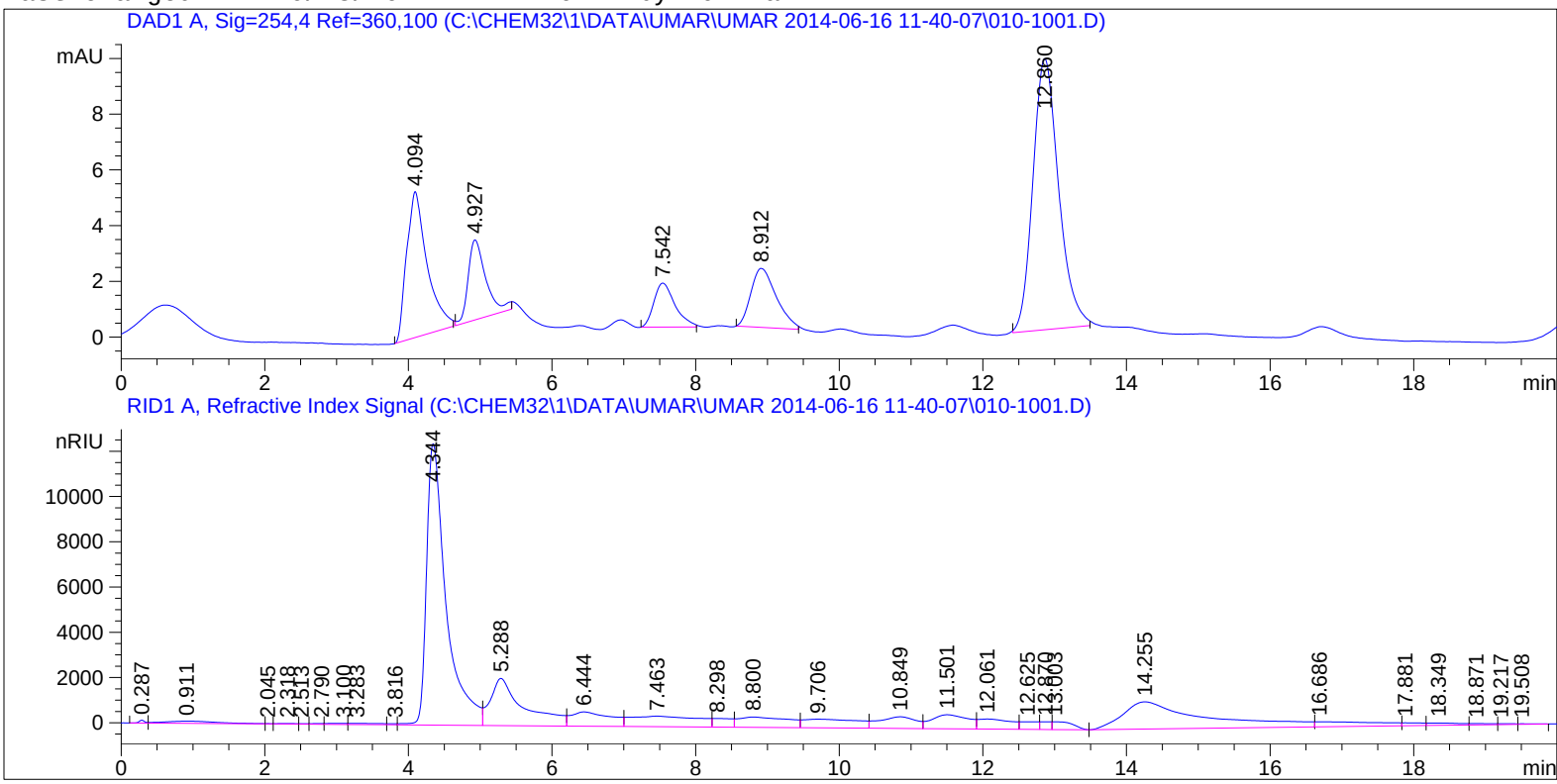
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.288	BV	0.0774	557.54626	112.15160	0.0992
2	0.752	VV	0.1232	86.41446	8.79878	0.0154
3	1.444	VV	0.3481	1086.82690	37.35588	0.1934
4	1.580	VV	0.0870	258.09500	40.68077	0.0459
5	1.674	VV	0.5446	1969.79590	42.53491	0.3506
6	2.423	VV	0.1897	625.91943	41.31301	0.1114
7	2.668	VV	0.4041	1418.44031	42.30355	0.2524
8	3.247	VV	0.2525	595.32379	39.29057	0.1059
9	3.542	VV	0.1413	488.26486	42.93198	0.0869
10	3.824	VV	0.1447	616.71228	52.87379	0.1098
11	4.349	VV	0.2825	2.37151e5	1.23408e4	42.2048
12	5.291	VV	0.4427	6.80005e4	2040.85059	12.1018
13	6.428	VV	0.4813	1.88493e4	525.21643	3.3545
14	7.165	VV	0.2830	8757.75000	407.79300	1.5586
15	7.441	VV	0.5633	1.77917e4	394.17834	3.1663
16	8.541	VV	0.5235	1.88722e4	480.03122	3.3586
17	9.076	VV	0.3606	9892.16602	329.95819	1.7605
18	9.785	VV	0.5312	1.34817e4	302.22998	2.3993
19	10.840	VV	0.4730	1.77599e4	532.97302	3.1607
20	11.480	VV	0.4902	2.20372e4	640.09949	3.9219
21	12.078	VV	0.4100	1.18260e4	399.66574	2.1046
22	12.738	VV	0.3359	8116.26660	299.17731	1.4444
23	13.043	VV	0.2695	6679.67285	303.71262	1.1888
24	14.264	VV	0.9637	8.91269e4	1212.04028	15.8615
25	17.279	VV	0.3044	2420.55054	94.10779	0.4308
26	17.771	VV	0.2852	1626.69897	69.15797	0.2895
27	18.097	VV	0.2998	1317.00806	53.98013	0.2344
28	18.551	VV	0.0885	192.30045	28.10052	0.0342
29	18.637	VV	0.1475	287.33820	24.91322	0.0511
30	18.964	VV	0.0742	15.96863	3.04034	2.842e-3
Totals :				5.61906e5	2.09423e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\010-1001.D
Sample Name: D1-2

```
==========================================================================
Acq. Operator   : umar                              Seq. Line :  10
Acq. Instrument : Instrument 1                      Location : Vial 10
Injection Date  : 6/16/2014 3:02:58 PM                   Inj :   1
                                                  Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.094 BB    0.2668  103.57610    5.23598  21.5919
   2   4.927 BB    0.2596   49.58802    2.87024  10.3373
   3   7.542 BB    0.3082   32.19748    1.57677   6.7120
   4   8.912 BB    0.3618   52.19287    2.11583  10.8804
   5  12.860 BB    0.3825  242.14328    9.72527  50.4783

Totals :                   479.69774   21.52409
```

Signal 2: RID1 A, Refractive Index Signal

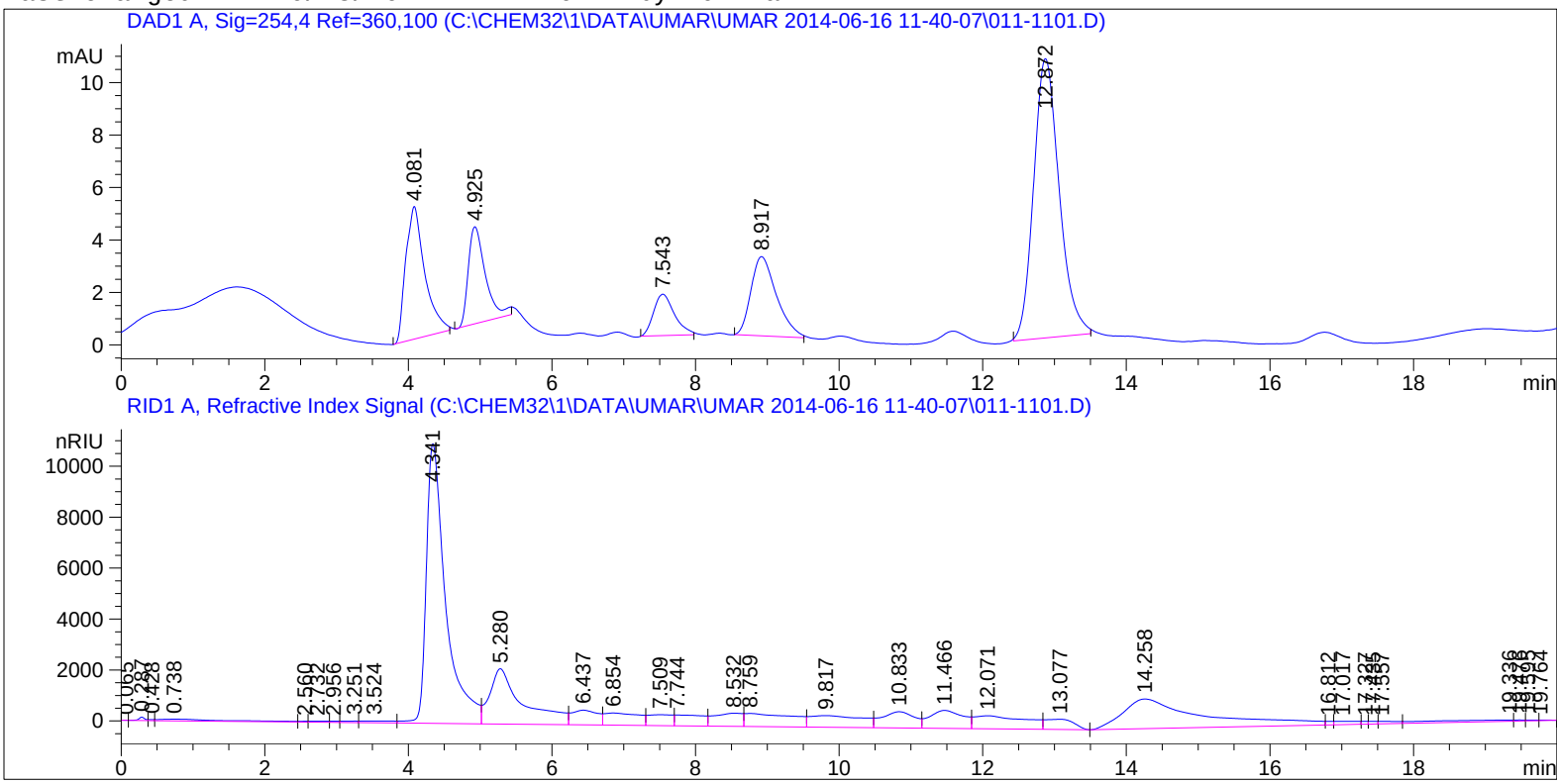
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.287	VV	0.0813	658.35492	124.07789	0.1094
2	0.911	VV	0.6240	4941.19434	93.68006	0.8211
3	2.045	VV	0.0933	77.21289	11.84374	0.0128
4	2.318	VV	0.2315	380.57159	19.92607	0.0632
5	2.513	VV	0.1074	186.04124	21.04720	0.0309
6	2.790	VV	0.1371	375.24762	34.66765	0.0624
7	3.100	VV	0.2238	845.48822	47.27996	0.1405
8	3.283	VV	0.3714	1618.60303	52.67797	0.2690
9	3.816	VV	0.1102	449.55887	51.66514	0.0747
10	4.344	VV	0.2791	2.35333e5	1.24350e4	39.1069
11	5.288	VV	0.4281	6.69526e4	2087.87573	11.1260
12	6.444	VV	0.5093	2.40183e4	630.38733	3.9913
13	7.463	VV	0.8143	3.05846e4	465.36725	5.0825
14	8.298	VV	0.2342	7047.63379	382.91675	1.1712
15	8.800	VV	0.6217	2.20549e4	458.47250	3.6650
16	9.706	VV	0.6588	2.03105e4	383.54901	3.3752
17	10.849	VV	0.4979	1.82487e4	514.66235	3.0325
18	11.501	VV	0.4960	2.20887e4	619.31036	3.6706
19	12.061	VV	0.4339	1.40150e4	442.99316	2.3290
20	12.625	VV	0.2125	5724.10840	334.60406	0.9512
21	12.870	VV	0.1316	3499.17310	337.90768	0.5815
22	13.003	VV	0.3304	6738.41943	339.89447	1.1198
23	14.255	VV	1.0520	9.46305e4	1205.32886	15.7254
24	16.686	VV	0.6959	1.31016e4	224.53722	2.1772
25	17.881	VV	0.2300	2487.61890	131.09758	0.4134
26	18.349	VV	0.3626	3213.87158	104.66319	0.5341
27	18.871	VV	0.2655	1245.55652	60.66253	0.2070
28	19.217	VV	0.1851	562.56549	38.60637	0.0935
29	19.508	VV	0.1954	377.67551	23.86523	0.0628
Totals :				6.01767e5	2.16785e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\011-1101.D
Sample Name: D1-3

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  11
Acq. Instrument : Instrument 1                   Location : Vial 11
Injection Date  : 6/16/2014 3:25:23 PM                Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.081 BB    0.2489   93.14211    5.05769  17.7657
   2   4.925 BB    0.2488   61.10113    3.69811  11.6543
   3   7.543 BB    0.2968   31.78952    1.57987   6.0635
   4   8.917 BB    0.3759   74.44803    3.01710  14.2000
   5  12.872 BB    0.3771  263.79977   10.64387  50.3165

Totals :                   524.28056   23.99664
```

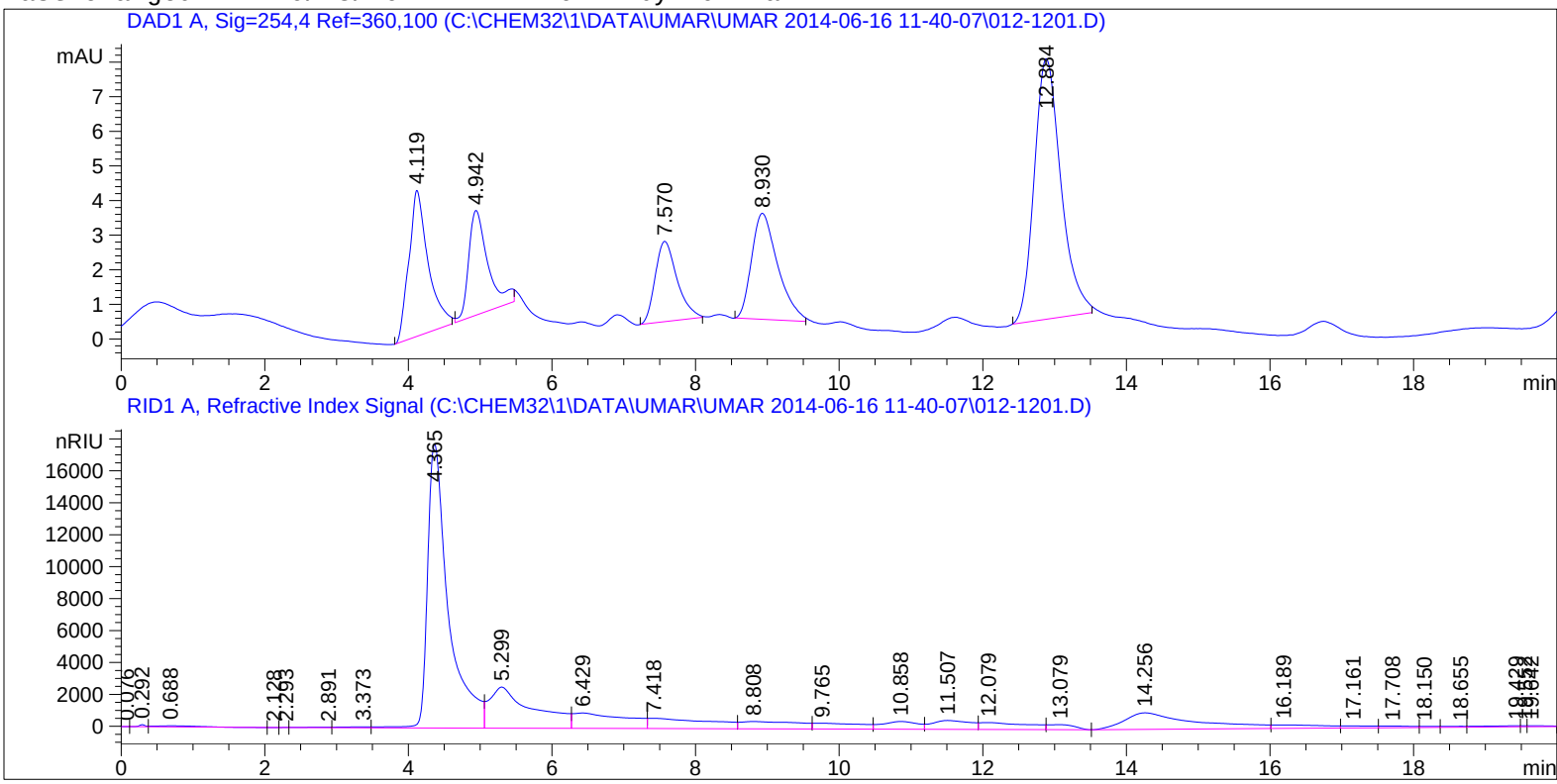
Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.065	BV	0.0621	20.45244	4.46564	3.515e-3
2	0.287	VV	0.0894	787.91724	131.40320	0.1354
3	0.428	VV	0.0776	216.19653	40.39754	0.0372
4	0.738	VV	0.8176	4565.38428	65.66393	0.7846
5	2.560	VV	0.1135	274.35501	34.04517	0.0472
6	2.732	VV	0.2146	744.06561	42.15062	0.1279
7	2.956	VV	0.1096	408.98654	47.27864	0.0703
8	3.251	VV	0.1758	867.15686	59.00571	0.1490
9	3.524	VV	0.3720	2230.44458	70.77632	0.3833
10	4.341	VV	0.2752	2.06054e5	1.09749e4	35.4132
11	5.280	VV	0.4305	6.92849e4	2171.77344	11.9075
12	6.437	VV	0.3464	1.44364e4	575.98798	2.4811
13	6.854	VV	0.4362	1.58673e4	476.33072	2.7270
14	7.509	VV	0.3140	9988.42676	426.84818	1.7166
15	7.744	VV	0.3352	1.15165e4	419.72989	1.9793
16	8.532	VV	0.3621	1.39622e4	514.20892	2.3996
17	8.759	VV	0.5814	2.37111e4	509.87863	4.0751
18	9.817	VV	0.6585	2.30285e4	455.82278	3.9578
19	10.833	VV	0.4499	1.99420e4	636.33344	3.4273
20	11.466	VV	0.4540	2.29185e4	706.68970	3.9389
21	12.071	VV	0.6470	2.56623e4	510.41702	4.4104
22	13.077	VV	0.3998	1.10049e4	401.41266	1.8913
23	14.258	VV	1.0302	9.01084e4	1164.55334	15.4863
24	16.812	VV	0.0902	1007.62677	144.05890	0.1732
25	17.017	VV	0.2633	2922.04272	132.74939	0.5022
26	17.327	VV	0.0771	677.53015	111.85848	0.1164
27	17.435	VV	0.1100	866.97351	106.61500	0.1490
28	17.557	VV	0.2191	1812.75720	98.46947	0.3115
29	19.336	VV	1.4078	5975.92871	49.82839	1.0270
30	19.476	VV	0.1273	417.51407	42.61873	0.0718
31	19.595	VV	0.1234	351.35574	35.06403	0.0604
32	19.764	VBA	0.1541	225.19992	24.35277	0.0387
Totals :				5.81858e5	2.11857e4	

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\012-1201.D
Sample Name: D1-4

```
==========================================================================
Acq. Operator   : umar                              Seq. Line :  12
Acq. Instrument : Instrument 1                       Location : Vial 12
Injection Date  : 6/16/2014 3:47:48 PM                  Inj :   1
                                                   Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.119 BB    0.2637   78.76197    4.22068  17.2481
   2   4.942 BB    0.2774   56.44307    3.02956  12.3605
   3   7.570 BB    0.3252   49.16967    2.32055  10.7677
   4   8.930 BB    0.3813   77.53770    3.06335  16.9800
   5  12.884 BB    0.3936  194.72928    7.53176  42.6438

Totals :                   456.64169   20.16590
```

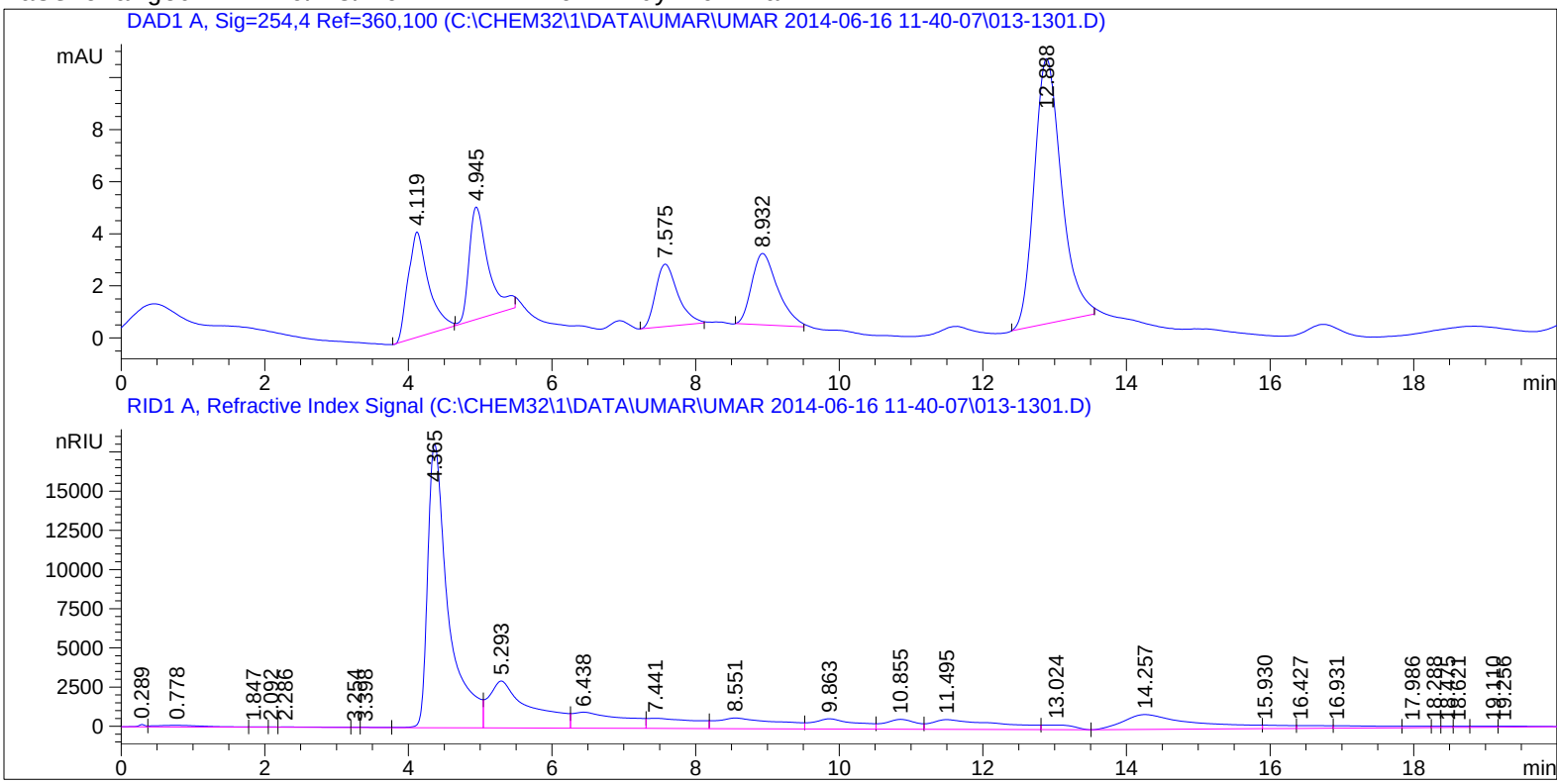
Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.076	BV	0.0721	14.20609	2.61193	1.859e-3
2	0.292	VV	0.0859	729.50964	128.09398	0.0955
3	0.688	VV	0.4871	2709.03271	66.95703	0.3545
4	2.128	VV	0.0931	17.58644	2.31206	2.301e-3
5	2.293	VV	0.0904	47.66029	7.17859	6.237e-3
6	2.891	VV	0.2944	760.58002	31.52692	0.0995
7	3.373	VV	0.3298	1543.48218	55.69936	0.2020
8	4.365	VV	0.2934	3.58566e5	1.77933e4	46.9198
9	5.299	VV	0.5500	1.08438e5	2572.91992	14.1896
10	6.429	VV	0.6615	4.90448e4	962.33209	6.4177
11	7.418	VV	0.7653	3.86806e4	640.29785	5.0615
12	8.808	VV	0.6965	2.58790e4	462.13364	3.3864
13	9.765	VV	0.5616	1.67833e4	365.49445	2.1962
14	10.858	VV	0.4813	1.67092e4	488.34808	2.1865
15	11.507	VV	0.5055	2.08730e4	558.04944	2.7313
16	12.079	VV	0.5965	2.02643e4	435.77267	2.6517
17	13.079	VV	0.3832	8085.38525	313.27045	1.0580
18	14.256	VV	0.9140	7.07170e4	1037.49194	9.2536
19	16.189	VV	0.5801	1.07738e4	220.79964	1.4098
20	17.161	VV	0.3514	3758.18188	127.12984	0.4918
21	17.708	VV	0.3668	3095.96631	101.44612	0.4051
22	18.150	VV	0.2053	1180.74329	70.81828	0.1545
23	18.655	VV	0.2745	1298.81787	57.46027	0.1700
24	19.429	VV	0.4872	2655.38892	65.62868	0.3475
25	19.552	VV	0.0790	348.24304	61.56726	0.0456
26	19.642	VBA	0.2494	1236.46838	59.37502	0.1618
Totals :				7.64210e5	2.66880e4	

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\013-1301.D
Sample Name: D1-5

```
==========================================================================
Acq. Operator   : umar                              Seq. Line :  13
Acq. Instrument : Instrument 1                       Location : Vial 13
Injection Date  : 6/16/2014 4:10:10 PM                  Inj :   1
                                                   Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.119 BB    0.2756   79.47823    4.03874  14.5247
   2   4.945 BB    0.2719   79.85003    4.31570  14.5927
   3   7.575 BB    0.3235   51.21841    2.39544   9.3602
   4   8.932 BB    0.3672   68.89948    2.74133  12.5914
   5  12.888 BB    0.4070  267.74725   10.17489  48.9310

Totals :                   547.19340   23.66611
```

Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.289	BV	0.0987	997.18896	146.73235	0.1248
2	0.778	VV	0.5687	4871.42529	101.48358	0.6096
3	1.847	VV	0.2043	276.53922	16.67600	0.0346
4	2.092	VV	0.0999	144.58737	18.05338	0.0181
5	2.286	VV	0.6444	1099.51501	20.04053	0.1376
6	3.254	VV	0.0981	123.14462	16.06499	0.0154
7	3.398	VV	0.2880	419.22131	17.64565	0.0525
8	4.365	VV	0.2913	3.61789e5	1.81196e4	45.2743
9	5.293	VV	0.5368	1.21221e5	2996.30591	15.1697
10	6.438	VV	0.6362	5.02436e4	1022.00403	6.2875
11	7.441	VV	0.5957	2.98758e4	645.95929	3.7387
12	8.551	VV	0.7709	4.11397e4	681.85937	5.1482
13	9.863	VV	0.5682	2.76870e4	650.04401	3.4648
14	10.855	VV	0.4373	1.92144e4	627.19702	2.4045
15	11.495	VV	0.8500	4.11430e4	621.58698	5.1486
16	13.024	VV	0.3491	8680.58301	293.69748	1.0863
17	14.257	VV	0.9200	6.39225e4	948.68146	7.9993
18	15.930	VV	0.3108	5702.15771	220.17636	0.7136
19	16.427	VV	0.3459	5320.71631	181.70860	0.6658
20	16.931	VV	0.5403	7180.67139	159.51366	0.8986
21	17.986	VV	0.2864	2206.79834	94.14136	0.2762
22	18.288	VV	0.0961	635.66327	80.80663	0.0795
23	18.475	VV	0.1271	773.90491	74.84705	0.0968
24	18.621	VV	0.1624	955.46173	71.50535	0.1196
25	19.110	VV	0.2792	1503.24780	63.80033	0.1881
26	19.256	VBA	0.3892	1977.04590	59.92443	0.2474
Totals :				7.99104e5	2.79500e4	

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\014-1401.D
Sample Name: D1-6

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  14
Acq. Instrument : Instrument 1                   Location : Vial 14
Injection Date  : 6/16/2014 4:32:33 PM               Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
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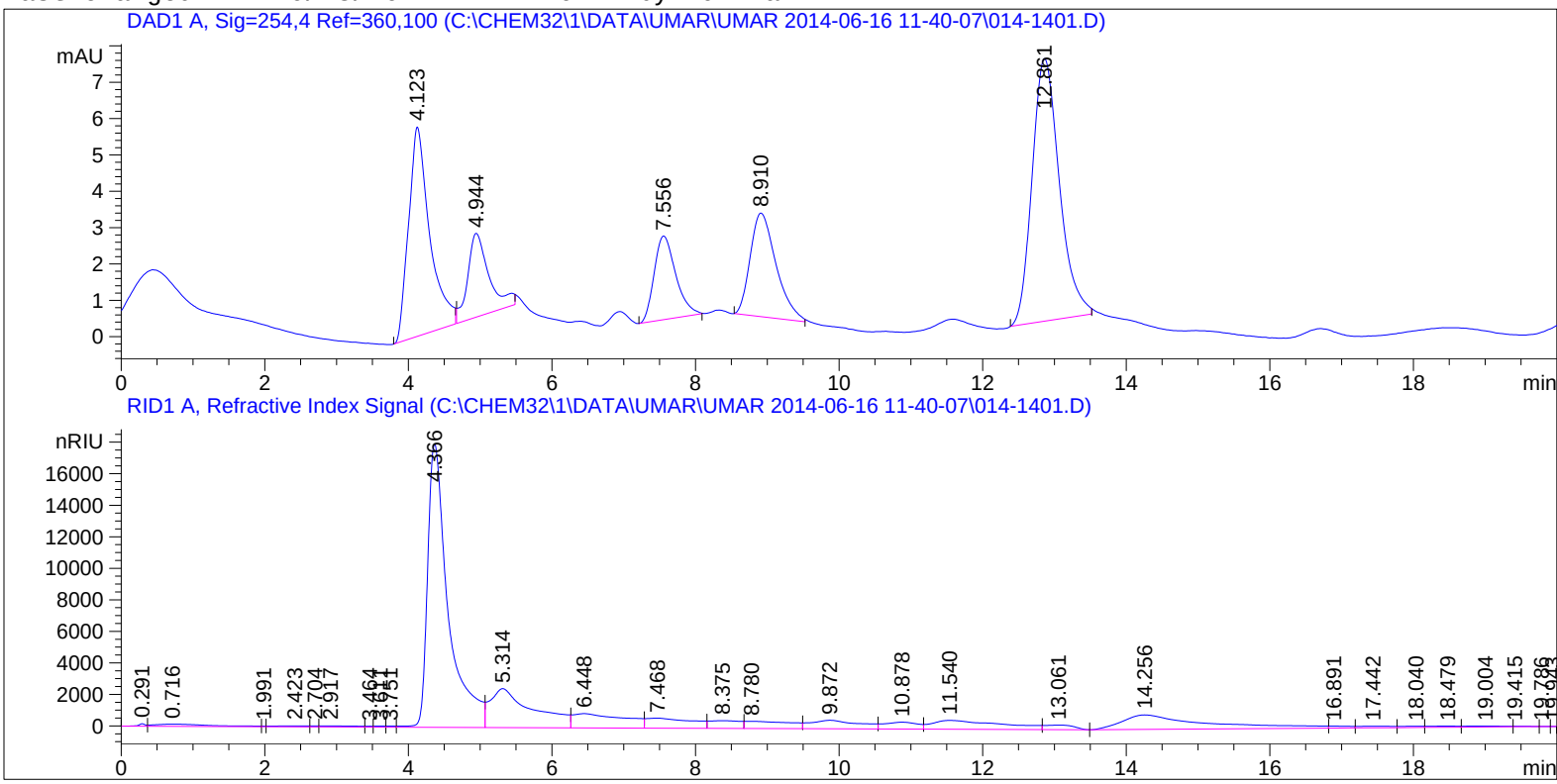



```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.123 BB    0.2837  117.35822    5.76033  24.7208
   2   4.944 BB    0.2958   47.39012    2.30583   9.9825
   3   7.556 BB    0.3199   48.10597    2.30120  10.1332
   4   8.910 BB    0.3838   71.25018    2.84826  15.0084
   5  12.861 BB    0.4059  190.62939    7.22375  40.1550

Totals :                   474.73388   20.43937
```

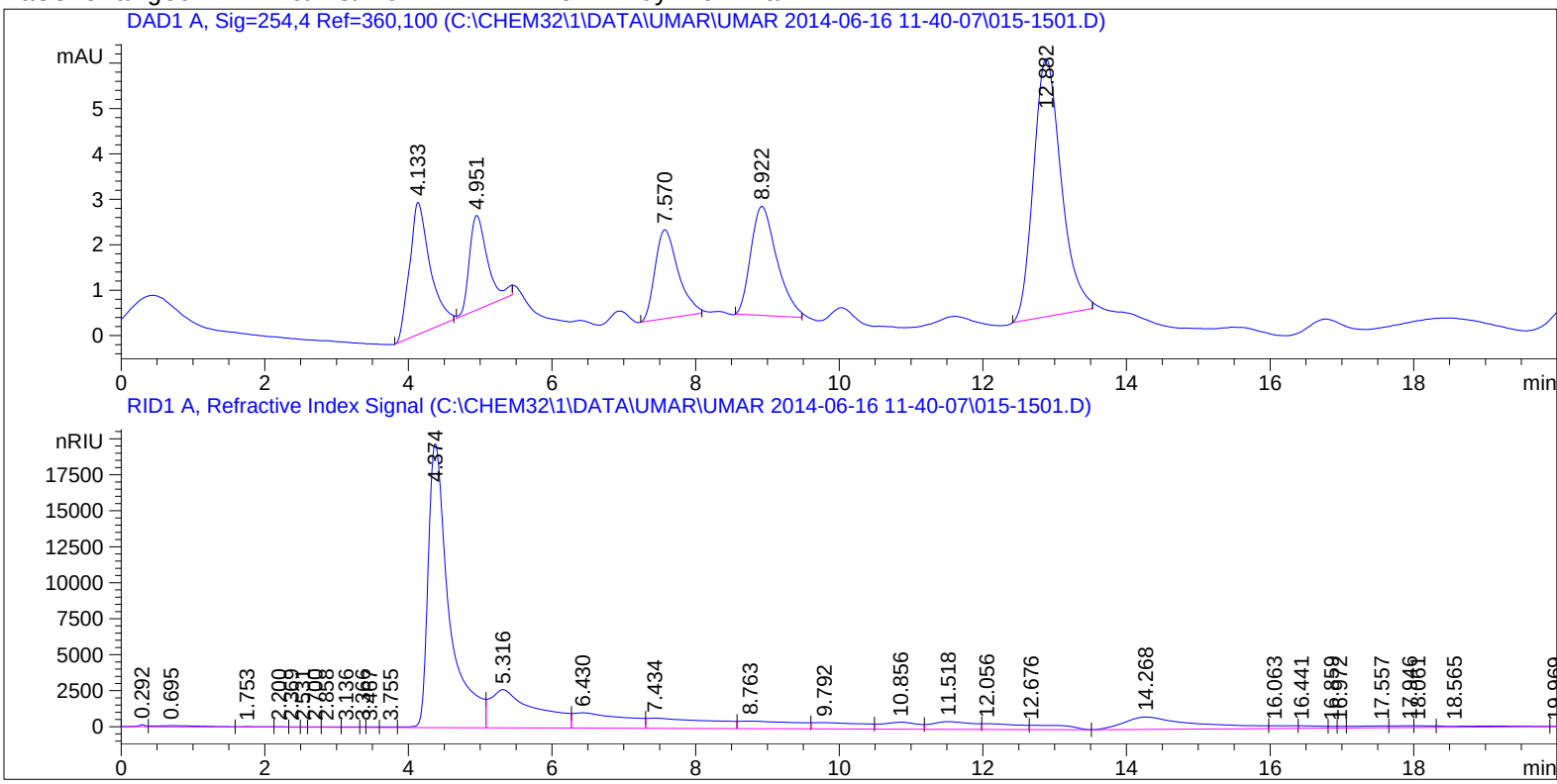
Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.291	BV	0.0993	1055.39978	154.11546	0.1396
2	0.716	VV	0.6722	7628.60645	138.18228	1.0089
3	1.991	VV	0.0560	161.83289	41.73658	0.0214
4	2.423	VV	0.3939	1848.41187	55.35846	0.2444
5	2.704	VV	0.0963	433.34091	57.66594	0.0573
6	2.917	VV	0.4199	2289.53711	64.95534	0.3028
7	3.464	VV	0.0927	395.47171	57.86839	0.0523
8	3.611	VV	0.1370	652.49158	62.45113	0.0863
9	3.751	VV	0.1087	558.08698	63.70300	0.0738
10	4.366	VV	0.2907	3.58343e5	1.79878e4	47.3894
11	5.314	VV	0.5431	1.02223e5	2471.30957	13.5186
12	6.448	VV	0.6441	4.50864e4	904.68750	5.9625
13	7.468	VV	0.5692	2.82324e4	636.62549	3.7336
14	8.375	VV	0.3928	1.46595e4	492.27682	1.9387
15	8.780	VV	0.5345	2.02326e4	456.38821	2.6757
16	9.872	VV	0.6329	2.56250e4	540.62726	3.3888
17	10.878	VV	0.4670	1.41460e4	438.54550	1.8708
18	11.540	VV	0.9181	3.83820e4	560.24969	5.0759
19	13.061	VV	0.4222	8112.87744	289.32352	1.0729
20	14.256	VV	1.0574	7.33462e4	918.05066	9.6997
21	16.891	VV	0.2520	2521.20898	124.17821	0.3334
22	17.442	VV	0.3970	3260.06641	99.58630	0.4311
23	18.040	VV	0.2771	1789.11914	78.37178	0.2366
24	18.479	VV	0.3648	2178.05688	73.11478	0.2880
25	19.004	VV	0.4663	2309.60376	58.59515	0.3054
26	19.415	VV	0.1954	585.10632	36.55861	0.0774
27	19.786	VV	0.1151	95.38615	13.80958	0.0126
28	19.943	VBA	0.0630	15.89469	3.87020	2.102e-3
Totals :				7.56167e5	2.68800e4	

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\015-1501.D
Sample Name: D1-7

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  15
Acq. Instrument : Instrument 1                   Location : Vial 15
Injection Date  : 6/16/2014 4:54:53 PM               Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.133 BB    0.2788   57.07820    2.91016  16.3216
   2   4.951 BB    0.2628   36.47555    2.07795  10.4302
   3   7.570 BB    0.3360   43.58414    1.95567  12.4630
   4   8.922 BB    0.3675   60.40489    2.40081  17.2729
   5  12.882 BB    0.4025  152.16653    5.68028  43.5123

Totals :                   349.70932   15.02487
```

Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.292	BV	0.0959	944.96881	140.20305	0.1142
2	0.695	VV	0.5854	3701.43506	76.29771	0.4472
3	1.753	VV	0.3608	809.43799	27.14814	0.0978
4	2.200	VV	0.1508	303.28198	25.26898	0.0366
5	2.369	VV	0.1222	243.60661	25.03525	0.0294
6	2.531	VV	0.0812	158.33859	26.24647	0.0191
7	2.700	VV	0.1349	326.50711	29.16273	0.0394
8	2.858	VV	0.2010	525.83142	32.25892	0.0635
9	3.136	VV	0.1878	520.04010	33.45850	0.0628
10	3.366	VV	0.0646	180.66141	34.99273	0.0218
11	3.467	VV	0.1372	408.99600	37.10473	0.0494
12	3.755	VV	0.1749	588.74640	40.26064	0.0711
13	4.374	VV	0.2983	4.02086e5	1.97243e4	48.5766
14	5.316	VV	0.5825	1.19143e5	2662.51587	14.3938
15	6.430	VV	0.6513	5.34190e4	1062.52563	6.4536
16	7.434	VV	0.8117	4.51650e4	705.44696	5.4565
17	8.763	VV	0.7109	2.91663e4	524.87231	3.5236
18	9.792	VV	0.5943	2.10898e4	434.55338	2.5479
19	10.856	VV	0.4856	1.68409e4	484.26447	2.0346
20	11.518	VV	0.5460	2.13612e4	534.73407	2.5807
21	12.056	VV	0.4211	1.38866e4	394.85034	1.6777
22	12.676	VV	0.4690	1.15097e4	301.61624	1.3905
23	14.268	VV	0.9359	5.94446e4	857.84430	7.1816
24	16.063	VV	0.2869	4613.05225	194.93030	0.5573
25	16.441	VV	0.2697	3921.56421	173.79968	0.4738
26	16.859	VV	0.1031	997.80292	132.28429	0.1205
27	16.972	VV	0.1005	945.31451	125.99985	0.1142
28	17.557	VV	0.4022	4440.22412	130.91653	0.5364
29	17.946	VV	0.2516	2627.67627	125.05848	0.3175
30	18.061	VV	0.2136	2103.63940	121.04031	0.2541
31	18.565	VV	0.7230	6183.71045	102.86284	0.7471
32	19.969	VBA	0.0809	79.17446	13.58987	9.565e-3
Totals :				8.27736e5	2.93354e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\016-1601.D
Sample Name: D1-8

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  16
Acq. Instrument : Instrument 1                   Location : Vial 16
Injection Date  : 6/16/2014 5:17:12 PM                Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
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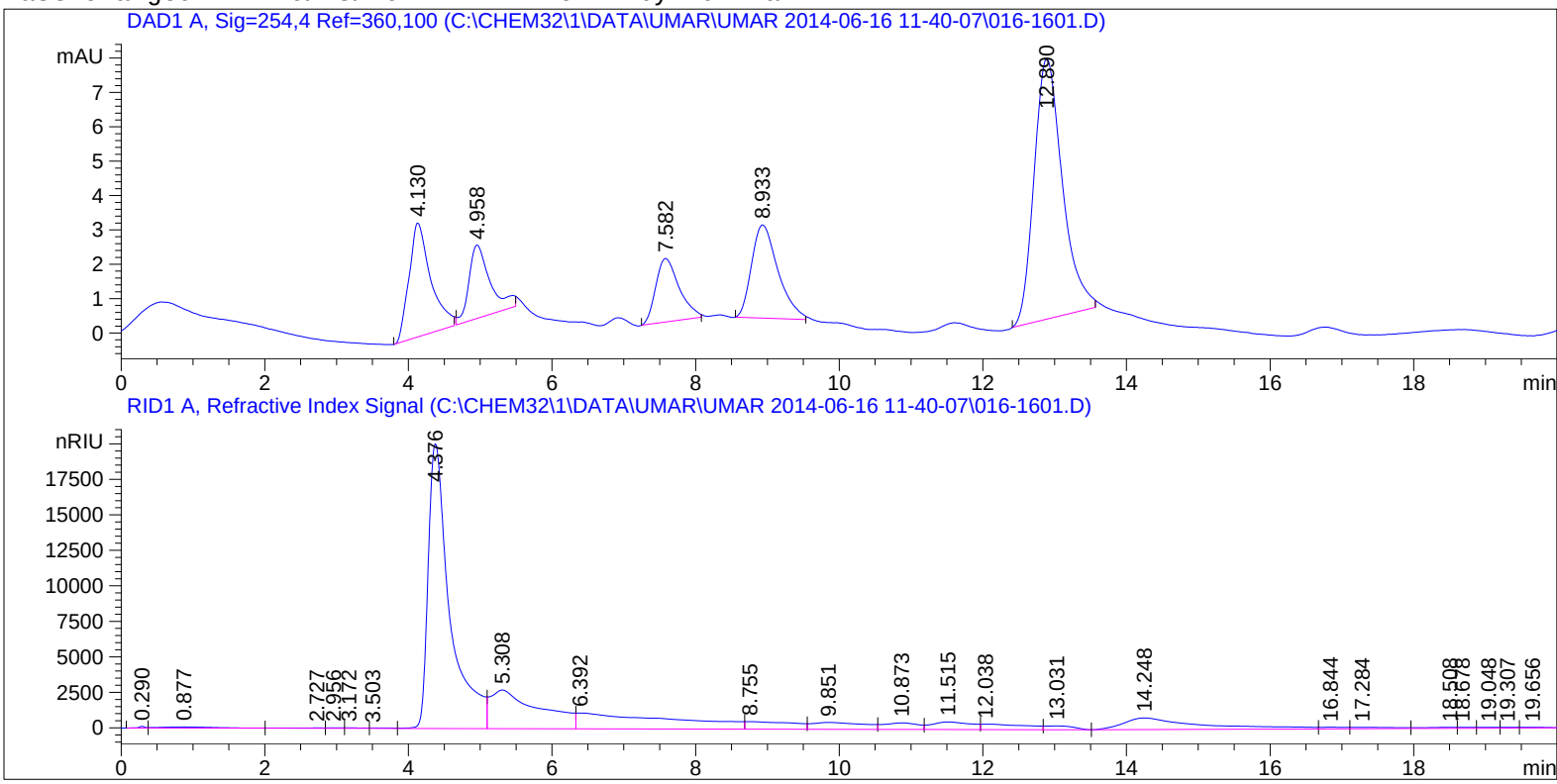



```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.130 BB    0.2938   69.30373    3.31694  16.0659
   2   4.958 BB    0.2958   43.88246    2.13471  10.1728
   3   7.582 BB    0.3342   41.86009    1.84841   9.7040
   4   8.933 BB    0.3883   69.33318    2.71179  16.0727
   5  12.890 BB    0.4145  206.99156    7.58207  47.9846

Totals :                   431.37103   17.59391
```

Signal 2: RID1 A, Refractive Index Signal

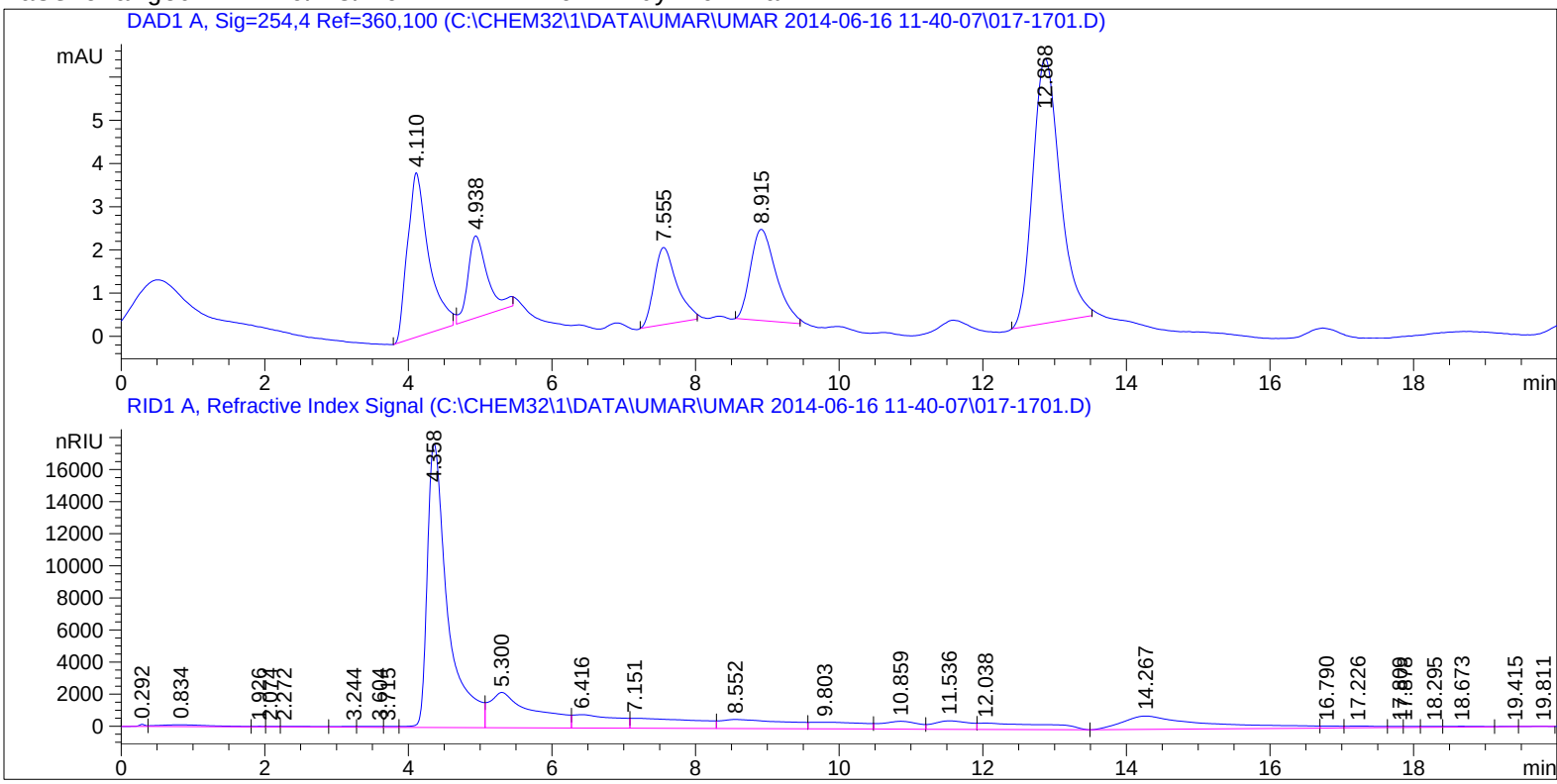
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.290	VV	0.0834	628.66858	114.61533	0.0742
2	0.877	VV	0.6407	4083.65430	76.69105	0.4822
3	2.727	VV	0.4630	1121.60583	28.66283	0.1324
4	2.956	VV	0.1900	504.26468	32.05608	0.0595
5	3.172	VV	0.2439	675.11578	33.47820	0.0797
6	3.503	VV	0.2695	662.76013	30.91612	0.0783
7	4.376	VV	0.3061	4.22118e5	2.00513e4	49.8465
8	5.308	VV	0.6190	1.29782e5	2721.25244	15.3255
9	6.392	VV	1.1564	1.04852e5	1107.48987	12.3816
10	8.755	VV	0.5969	2.45107e4	524.63330	2.8944
11	9.851	VV	0.6594	2.42015e4	485.39917	2.8579
12	10.873	VV	0.4591	1.51845e4	461.99319	1.7931
13	11.515	VV	0.5289	2.04303e4	536.03125	2.4125
14	12.038	VV	0.5164	1.66456e4	382.43353	1.9656
15	13.031	VV	0.4212	7281.53418	263.92776	0.8599
16	14.248	VV	0.9899	6.04463e4	817.70953	7.1379
17	16.844	VV	0.3183	2760.10425	110.93822	0.3259
18	17.284	VV	0.5024	4117.18115	97.27889	0.4862
19	18.508	VV	0.4066	2478.89624	73.07110	0.2927
20	18.678	VV	0.1828	1028.14453	68.03844	0.1214
21	19.048	VV	0.2366	1184.85303	62.42619	0.1399
22	19.307	VV	0.1890	882.33539	57.77559	0.1042
23	19.656	VBA	0.3135	1255.97644	49.10374	0.1483
Totals :				8.46836e5	2.81872e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\017-1701.D
Sample Name: D1-9

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  17
Acq. Instrument : Instrument 1                   Location : Vial 17
Injection Date  : 6/16/2014 5:39:36 PM                Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.110 BB    0.2789   77.89075    3.80393  21.2661
   2   4.938 BB    0.2798   36.04298    1.89562   9.8406
   3   7.555 BB    0.3202   38.84154    1.78297  10.6047
   4   8.915 BB    0.3601   52.06371    2.10802  14.2146
   5  12.868 BB    0.4055  161.42908    6.12564  44.0740

Totals :                   366.26804   15.71618
```

Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.292	BV	0.0911	808.31079	131.60498	0.1107
2	0.834	VV	0.6203	5788.08545	110.00481	0.7926
3	1.926	VV	0.1442	392.35956	33.76123	0.0537
4	2.074	VV	0.1486	432.10287	35.47125	0.0592
5	2.272	VV	0.4654	1409.00171	36.33435	0.1929
6	3.244	VV	0.2548	978.87054	48.51369	0.1340
7	3.604	VV	0.2520	1212.21472	58.10377	0.1660
8	3.715	VV	0.1655	774.86615	60.10390	0.1061
9	4.358	VV	0.2912	3.49809e5	1.76860e4	47.8992
10	5.300	VV	0.5635	9.56671e4	2200.09351	13.0997
11	6.416	VV	0.5407	3.47576e4	833.12408	4.7593
12	7.151	VV	0.7530	3.93504e4	618.53320	5.3882
13	8.552	VV	0.8104	3.64231e4	566.67542	4.9874
14	9.803	VV	0.6176	2.10975e4	413.01083	2.8889
15	10.859	VV	0.5101	1.74194e4	489.58936	2.3852
16	11.536	VV	0.4960	1.86366e4	528.07007	2.5519
17	12.038	VV	0.8661	2.72801e4	391.89279	3.7355
18	14.267	VV	1.0651	6.70099e4	831.84363	9.1756
19	16.790	VV	0.2380	2386.26294	124.92353	0.3268
20	17.226	VV	0.3868	3409.57739	107.03128	0.4669
21	17.809	VV	0.1646	920.90308	69.84121	0.1261
22	17.878	VV	0.2178	879.96985	67.33131	0.1205
23	18.295	VV	0.2306	1026.68542	56.15324	0.1406
24	18.673	VV	0.4280	1665.72278	46.34037	0.2281
25	19.415	VV	0.2350	410.11761	21.14073	0.0562
26	19.811	VBA	0.4312	356.53439	9.94493	0.0488
Totals :				7.30302e5	2.55755e4	

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\018-1801.D
Sample Name: D2-1

```
==========================================================================
Acq. Operator   : umar                              Seq. Line :  18
Acq. Instrument : Instrument 1                       Location : Vial 18
Injection Date  : 6/16/2014 6:02:00 PM                  Inj :   1
                                                   Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
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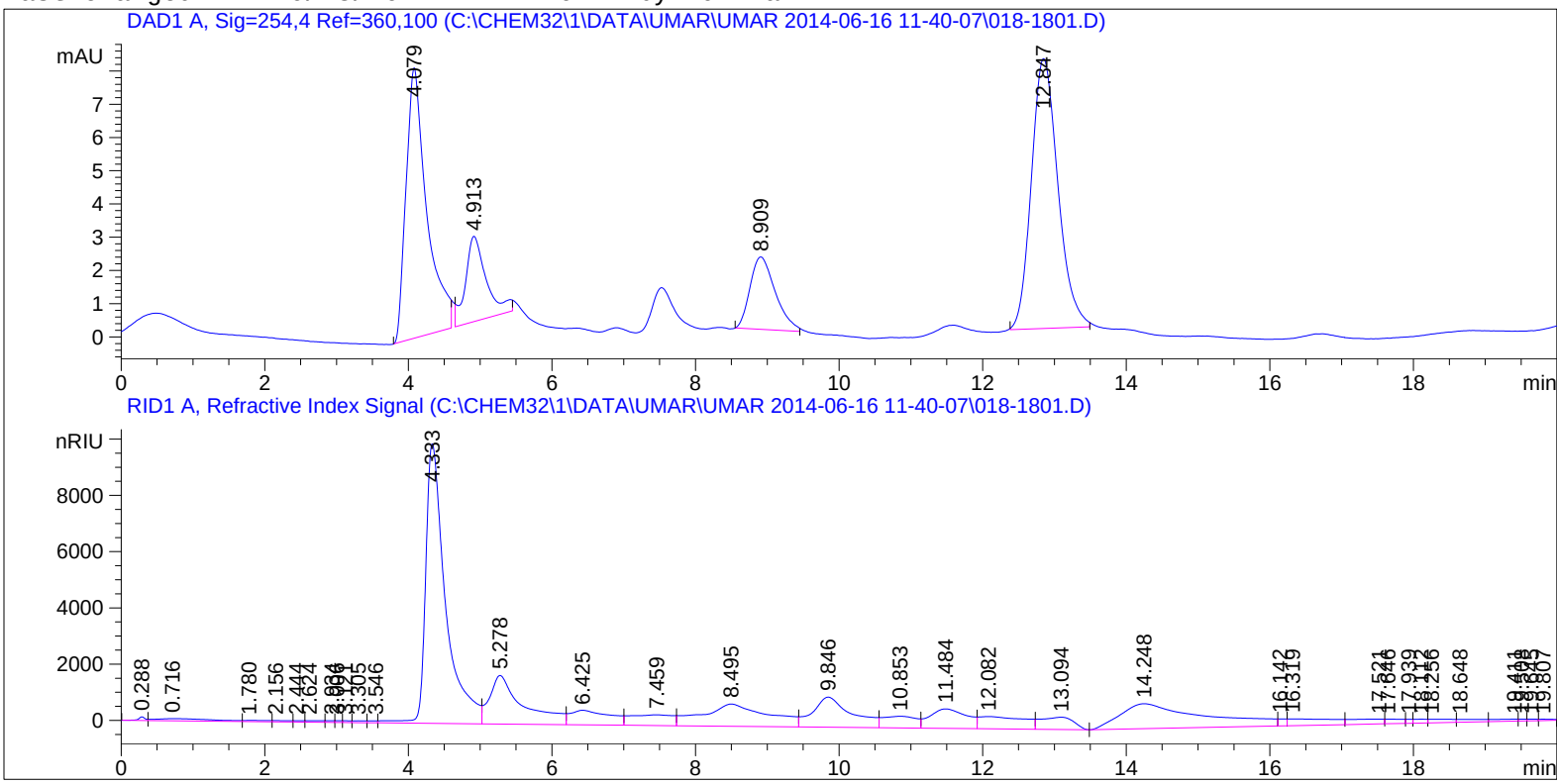


```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.079 BB    0.2723  162.03337    8.13613  34.0545
   2   4.913 BB    0.2895   51.79486    2.56538  10.8857
   3   8.909 BB    0.3656   53.32914    2.17880  11.2082
   4  12.847 BB    0.3919  208.64868    8.11754  43.8516

Totals :                   475.80606   20.99785
```

Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.288	BV	0.0961	852.91888	129.71983	0.1529
2	0.716	VV	0.6646	4387.30957	77.77574	0.7866
3	1.780	VV	0.3016	1003.64648	39.67078	0.1799
4	2.156	VV	0.2164	787.79993	43.77561	0.1412
5	2.444	VV	0.1227	489.30792	49.11209	0.0877
6	2.624	VV	0.2027	896.31677	53.29160	0.1607
7	2.934	VV	0.1005	468.15598	58.07571	0.0839
8	3.006	VV	0.0818	375.38803	59.82202	0.0673
9	3.121	VV	0.1077	490.90073	61.88361	0.0880
10	3.305	VV	0.1511	817.39642	65.93044	0.1465
11	3.546	VV	0.1142	633.92102	71.49432	0.1137
12	4.333	VV	0.2824	1.90874e5	9937.53125	34.2205
13	5.278	VV	0.4309	5.55107e4	1728.22742	9.9521
14	6.425	VV	0.5071	1.99141e4	517.69739	3.5703
15	7.459	VV	0.5316	1.57914e4	382.29730	2.8311
16	8.495	VV	0.8136	5.03606e4	791.52802	9.0288
17	9.846	VV	0.5148	3.99018e4	1070.41614	7.1537
18	10.853	VV	0.4396	1.33360e4	415.15845	2.3909
19	11.484	VV	0.5050	2.47058e4	692.19794	4.4293
20	12.082	VV	0.5776	1.91198e4	435.00012	3.4279
21	13.094	VV	0.4539	1.38427e4	436.90942	2.4818
22	14.248	VV	1.0590	7.10089e4	887.24005	12.7307
23	16.142	VV	0.0964	1910.87085	248.05640	0.3426
24	16.319	VV	0.5184	1.02625e4	237.91956	1.8399
25	17.521	VV	0.4109	5847.40674	172.36548	1.0483
26	17.646	VV	0.2074	2707.45898	164.24950	0.4854
27	17.939	VV	0.0859	907.12518	145.05437	0.1626
28	18.112	VV	0.1568	1720.37964	137.51865	0.3084
29	18.256	VV	0.2681	2816.72217	128.78929	0.5050
30	18.648	VV	0.2880	2474.22412	103.33468	0.4436
31	19.411	VV	0.3057	1842.90161	72.37962	0.3304
32	19.508	VV	0.0954	489.32788	67.51093	0.0877
33	19.645	VV	0.1165	567.77863	60.18505	0.1018
34	19.807	VBA	0.1674	661.91394	49.99766	0.1187
Totals :				5.57778e5	1.95921e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\019-1901.D
Sample Name: D2-2

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  19
Acq. Instrument : Instrument 1                   Location : Vial 19
Injection Date  : 6/16/2014 6:24:21 PM                Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
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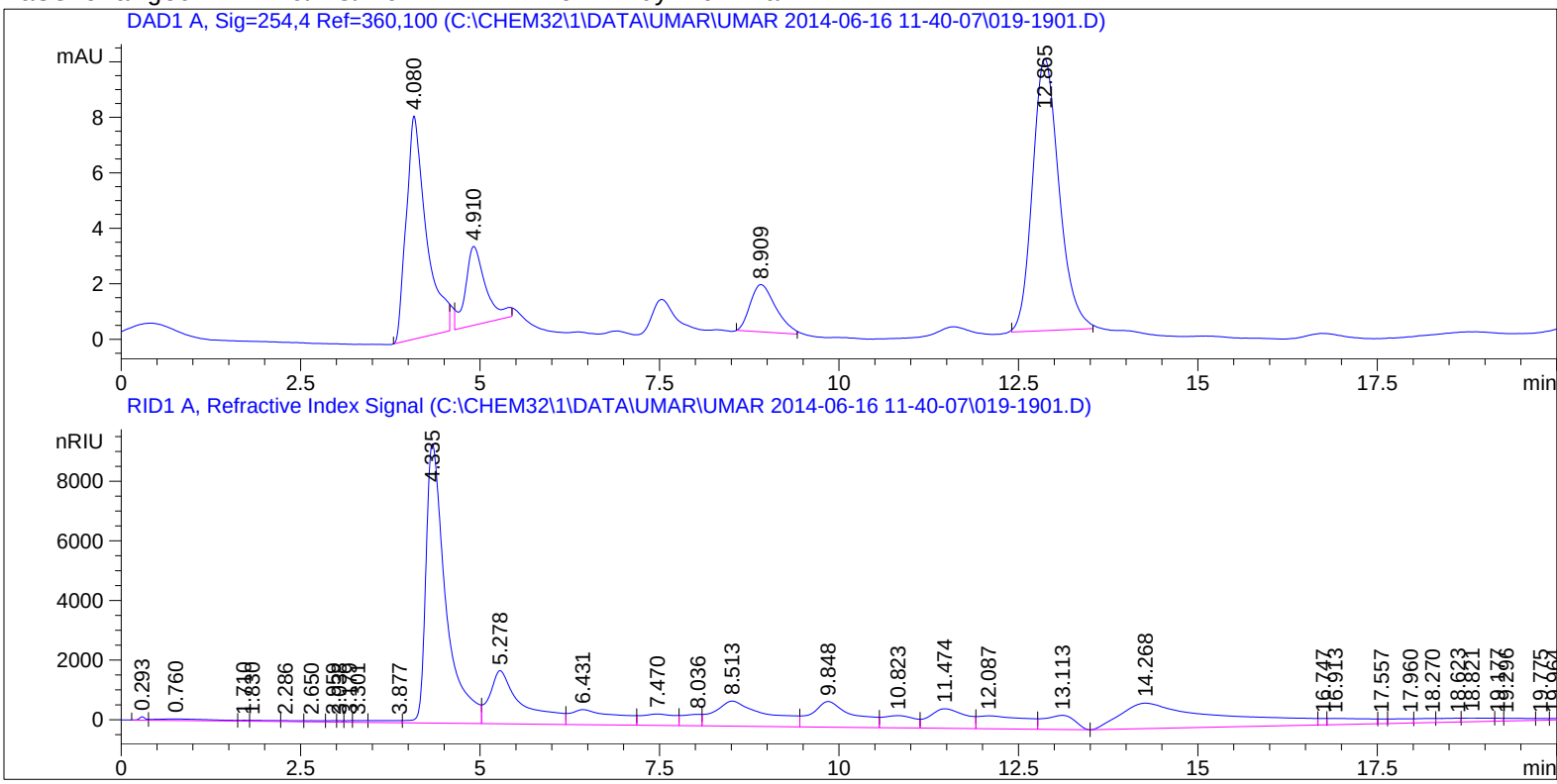


```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.080 BB    0.2632  156.49620    8.03732  30.9123
   2   4.910 BB    0.2844   56.11647    2.84123  11.0846
   3   8.909 BB    0.3636   41.97603    1.70291   8.2914
   4  12.865 BB    0.3996  251.66931    9.80045  49.7117

Totals :                   506.25801   22.38191
```

Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.293	VV	0.0835	618.66364	112.74583	0.1143
2	0.760	VV	0.6685	2830.31445	50.70768	0.5227
3	1.710	VV	0.1263	279.38617	29.31089	0.0516
4	1.830	VV	0.3009	773.50293	30.64810	0.1429
5	2.286	VV	0.2455	654.10413	32.81951	0.1208
6	2.650	VV	0.2279	748.88342	41.05563	0.1383
7	2.959	VV	0.1134	439.19113	48.90439	0.0811
8	3.038	VV	0.0793	306.58450	50.58570	0.0566
9	3.179	VV	0.0926	383.35916	54.65336	0.0708
10	3.301	VV	0.1608	754.54309	57.85357	0.1394
11	3.877	VV	0.3145	1975.88721	75.89219	0.3649
12	4.335	VV	0.2824	1.79936e5	9368.20703	33.2335
13	5.278	VV	0.4213	5.57868e4	1782.62769	10.3036
14	6.431	VV	0.5909	2.27738e4	502.95929	4.2062
15	7.470	VV	0.4362	1.24017e4	380.75580	2.2905
16	8.036	VV	0.2474	7023.55127	384.93619	1.2972
17	8.513	VV	0.6592	4.25146e4	840.51196	7.8523
18	9.848	VV	0.5427	3.45764e4	859.56372	6.3861
19	10.823	VV	0.4319	1.24599e4	410.49500	2.3013
20	11.474	VV	0.5081	2.32253e4	655.95563	4.2896
21	12.087	VV	0.5845	2.01647e4	432.88660	3.7243
22	13.113	VV	0.4425	1.40393e4	474.36954	2.5930
23	14.268	VV	1.2279	8.03558e4	853.55969	14.8414
24	16.747	VV	0.0948	1629.49719	215.31795	0.3010
25	16.913	VV	0.4529	7964.49219	208.11998	1.4710
26	17.557	VV	0.1099	1288.28748	158.65793	0.2379
27	17.960	VV	0.2717	3204.29321	143.28015	0.5918
28	18.270	VV	0.2221	2544.95361	136.32352	0.4700
29	18.623	VV	0.2687	2757.50684	129.07826	0.5093
30	18.821	VV	0.3168	3247.32080	122.08510	0.5998
31	19.177	VV	0.0911	732.99518	98.49914	0.1354
32	19.296	VV	0.3808	2086.52271	91.31049	0.3854
33	19.775	VV	0.1339	648.28876	58.34891	0.1197
34	19.964	VBA	0.0801	302.53531	47.92532	0.0559
Totals :				5.41429e5	1.89410e4	

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\020-2001.D
Sample Name: D2-3

```
==========================================================================
Acq. Operator   : umar                              Seq. Line :  20
Acq. Instrument : Instrument 1                      Location : Vial 20
Injection Date  : 6/16/2014 6:46:44 PM                   Inj :   1
                                                  Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
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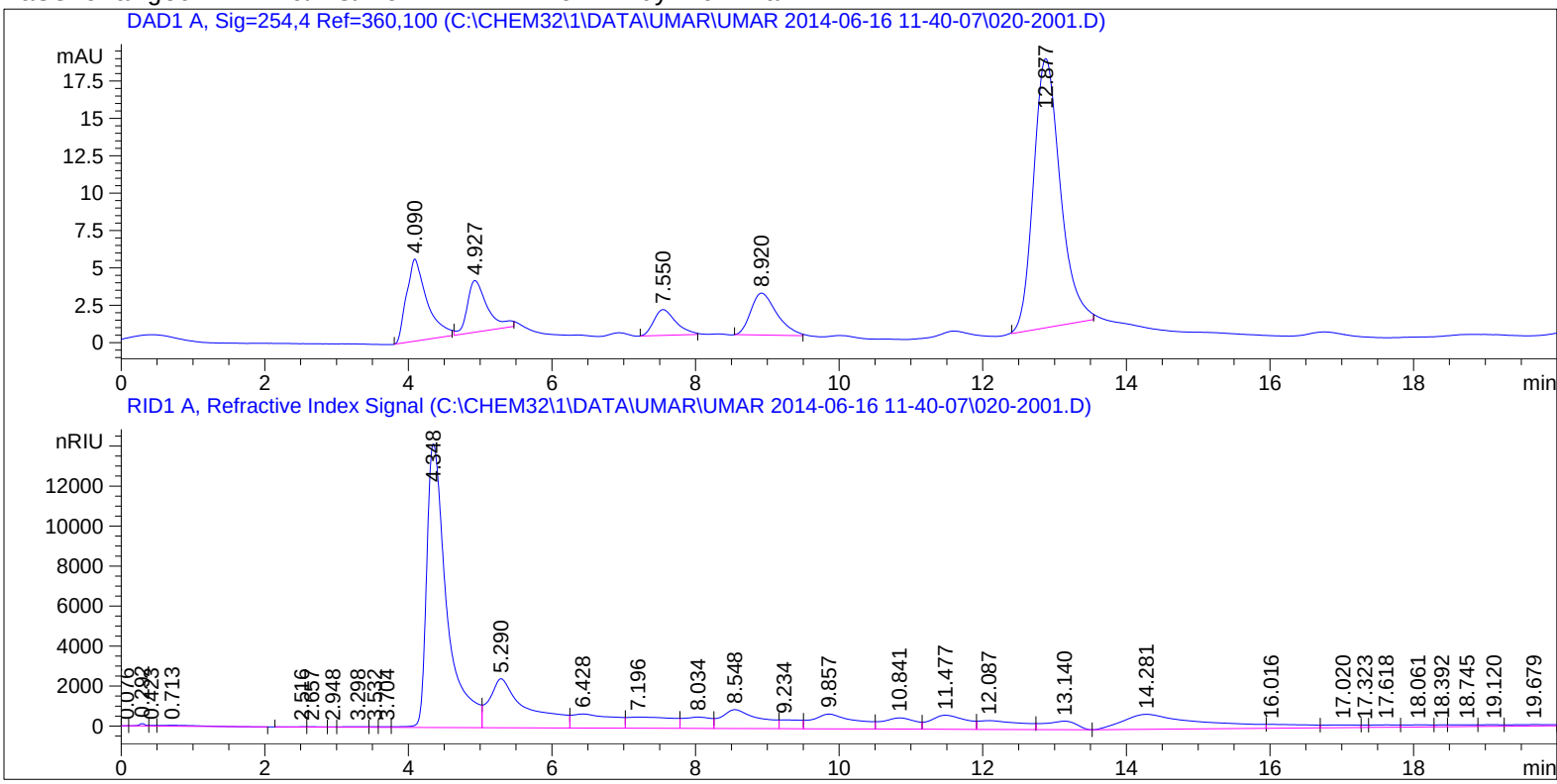


```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.090 BB    0.2637  108.21655    5.49725  14.4320
   2   4.927 BB    0.2867   67.16161    3.45596   8.9568
   3   7.550 BB    0.3196   36.87045    1.72333   4.9171
   4   8.920 BB    0.3718   70.64039    2.80466   9.4208
   5  12.877 BB    0.3966  466.94843   18.00342  62.2733

Totals :                   749.83742   31.48462
```

Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.076	BV	0.0549	18.84280	4.34884	2.825e-3
2	0.292	VV	0.0905	708.62274	116.28516	0.1062
3	0.423	VV	0.0863	195.29984	30.18885	0.0293
4	0.713	VV	0.4609	1661.34192	43.06587	0.2491
5	2.516	VV	0.1930	195.36443	12.21918	0.0293
6	2.657	VV	0.1991	243.32611	14.57127	0.0365
7	2.948	VV	0.0944	115.93285	15.38128	0.0174
8	3.298	VV	0.2828	641.61041	27.08657	0.0962
9	3.532	VV	0.1010	230.10855	29.75880	0.0345
10	3.704	VV	0.1257	350.65161	33.71214	0.0526
11	4.348	VV	0.2892	2.75426e5	1.41850e4	41.2938
12	5.290	VV	0.4832	8.93006e4	2451.83154	13.3886
13	6.428	VV	0.5278	2.82479e4	701.96863	4.2351
14	7.196	VV	0.5435	2.43485e4	555.76379	3.6505
15	8.034	VV	0.3634	1.50130e4	566.19318	2.2509
16	8.548	VV	0.4986	3.47282e4	943.29291	5.2067
17	9.234	VV	0.2510	8887.79004	439.53900	1.3325
18	9.857	VV	0.5618	3.10111e4	737.57178	4.6494
19	10.841	VV	0.4545	1.77930e4	560.62579	2.6677
20	11.477	VV	0.4944	2.44313e4	702.40460	3.6629
21	12.087	VV	0.5435	1.83728e4	439.87241	2.7546
22	13.140	VV	0.4581	1.32763e4	426.61719	1.9905
23	14.281	VV	0.9907	5.50266e4	751.20496	8.2500
24	16.016	VV	0.4692	7575.30273	192.80708	1.1357
25	17.020	VV	0.4098	4431.39014	131.71373	0.6644
26	17.323	VV	0.0829	725.96155	117.41792	0.1088
27	17.618	VV	0.3150	3085.43335	118.31300	0.4626
28	18.061	VV	0.3299	2885.57593	106.21687	0.4326
29	18.392	VV	0.1532	1061.47705	95.65907	0.1591
30	18.745	VV	0.3055	2260.81079	88.85329	0.3390
31	19.120	VV	0.2671	1770.49683	81.96076	0.2654
32	19.679	VBA	0.4982	2969.89795	71.41162	0.4453
Totals :				6.66991e5	2.47928e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\021-2101.D
Sample Name: D2-4

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  21
Acq. Instrument : Instrument 1                   Location : Vial 21
Injection Date  : 6/16/2014 7:09:06 PM                Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
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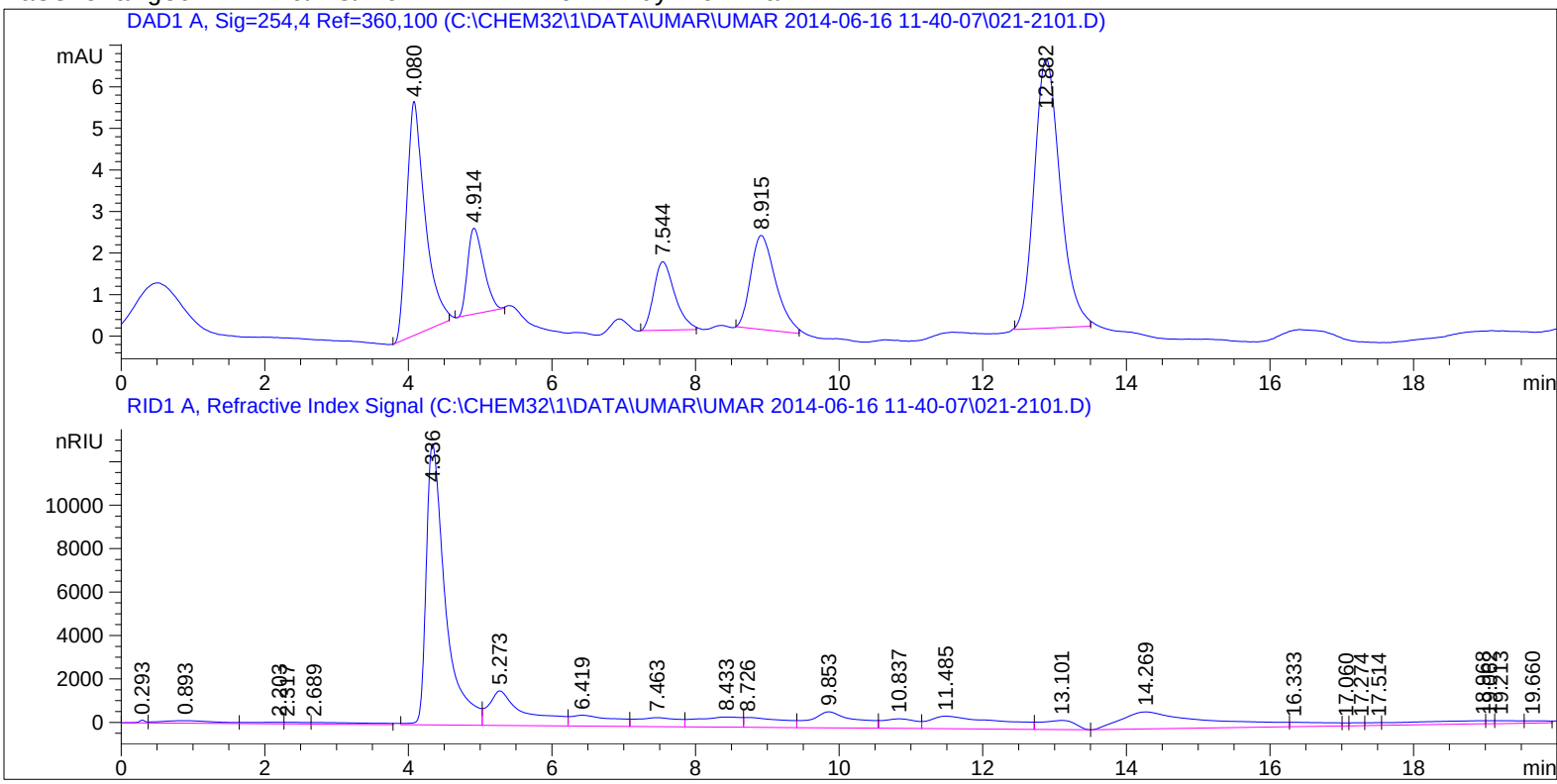



```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.080 BB    0.2617  100.30826    5.63429  26.2033
   2   4.914 BB    0.2375   32.10970    2.06382   8.3879
   3   7.544 BB    0.3028   33.41600    1.64601   8.7292
   4   8.915 BB    0.3524   54.31618    2.26032  14.1889
   5  12.882 BB    0.3827  162.65820    6.48368  42.4908

Totals :                   382.80835   18.08812
```

Signal 2: RID1 A, Refractive Index Signal

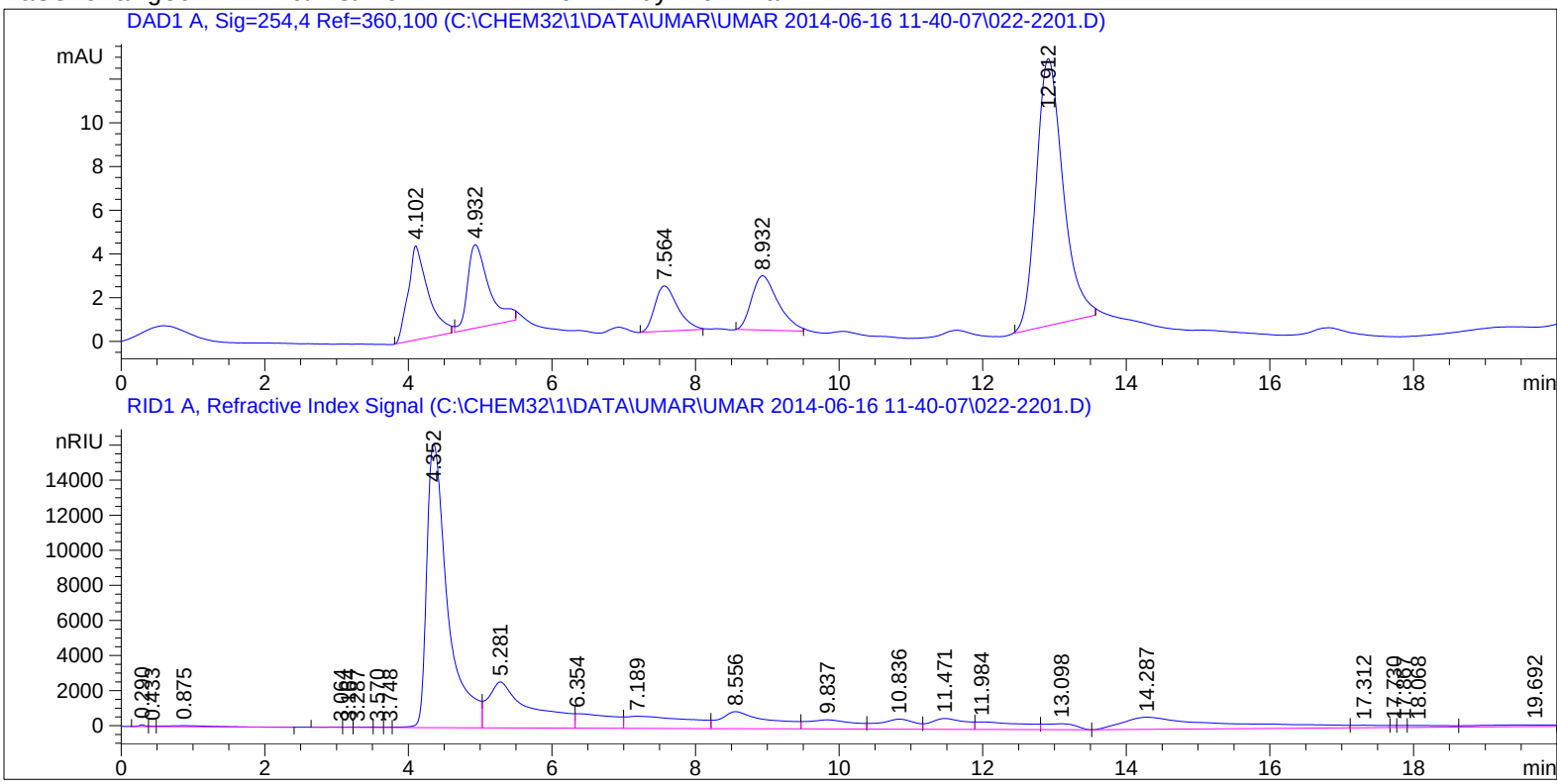
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.293	BV	0.0948	797.20441	123.38712	0.1373
2	0.893	VV	0.6312	6070.24023	115.36256	1.0454
3	2.203	VV	0.3806	2336.08521	73.70275	0.4023
4	2.317	VV	0.2689	1717.45728	75.72046	0.2958
5	2.689	VB	0.7253	4683.56055	76.47153	0.8066
6	4.336	BV	0.2744	2.39780e5	1.29447e4	41.2948
7	5.273	VV	0.4636	5.56082e4	1592.30090	9.5768
8	6.419	VV	0.5568	2.09772e4	499.63797	3.6127
9	7.463	VV	0.5396	1.68966e4	413.28958	2.9099
10	8.433	VV	0.5572	2.02064e4	466.44000	3.4799
11	8.726	VV	0.4893	1.70230e4	449.51013	2.9317
12	9.853	VV	0.5739	3.18662e4	739.72717	5.4880
13	10.837	VV	0.4529	1.40606e4	439.77579	2.4215
14	11.485	VV	0.8939	3.98093e4	578.25836	6.8559
15	13.101	VV	0.4748	1.38635e4	421.11285	2.3876
16	14.269	VV	1.0770	6.46950e4	784.12762	11.1417
17	16.333	VV	0.4594	7657.55127	202.08788	1.3188
18	17.060	VV	0.0775	804.56384	140.74002	0.1386
19	17.274	VV	0.1648	1770.83484	132.30592	0.3050
20	17.514	VV	0.1772	1806.65063	128.32394	0.3111
21	18.968	VV	0.9578	1.18366e4	145.16199	2.0385
22	19.062	VV	0.1029	1060.35144	140.93326	0.1826
23	19.213	VV	0.2742	3042.91040	133.66914	0.5240
24	19.660	VV	0.2635	2284.74487	104.56874	0.3935
Totals :				5.80655e5	2.09213e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\022-2201.D
Sample Name: D2-5

```
==========================================================================
Acq. Operator   : umar                              Seq. Line :  22
Acq. Instrument : Instrument 1                      Location : Vial 22
Injection Date  : 6/16/2014 7:31:24 PM                  Inj :   1
                                                   Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.102 BB    0.2552   83.08336    4.30372  14.1368
   2   4.932 BB    0.3108   79.43201    3.81611  13.5155
   3   7.564 BB    0.3351   45.59650    2.06937   7.7583
   4   8.932 BB    0.3812   63.28760    2.48479  10.7685
   5  12.912 BB    0.3961  316.31192   12.21688  53.8210

Totals :                   587.71139   24.89086
```

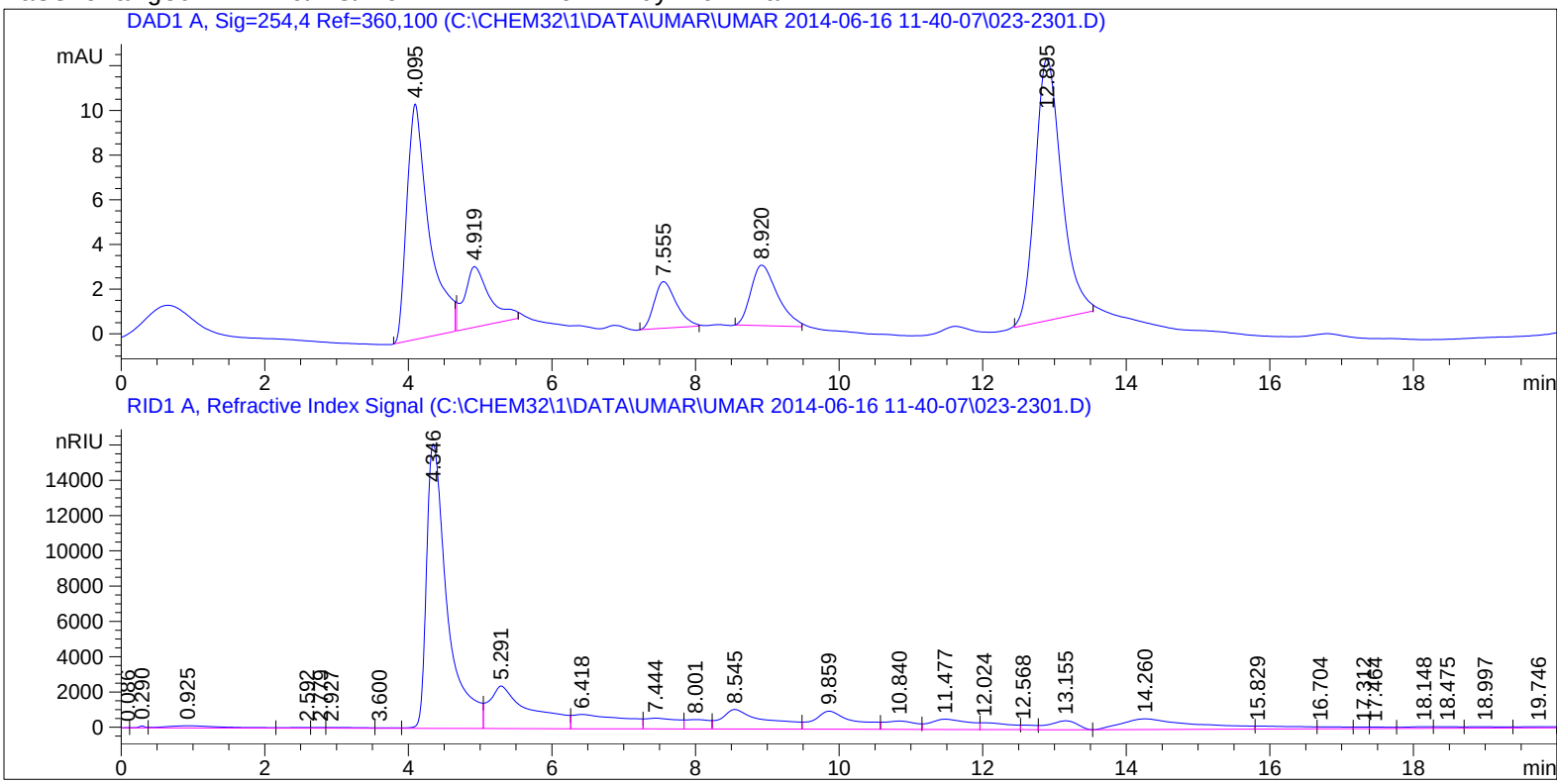
Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.290	BV	0.0805	508.10468	97.07381	0.0684
2	0.433	VV	0.0865	124.09510	20.27696	0.0167
3	0.875	VV	0.4930	2388.93408	57.80492	0.3217
4	3.064	VV	0.1829	312.37152	21.18178	0.0421
5	3.164	VV	0.1044	199.31519	23.74695	0.0268
6	3.287	VV	0.2007	416.82773	25.60333	0.0561
7	3.570	VV	0.1057	216.61165	25.45877	0.0292
8	3.748	VV	0.0897	196.66112	27.58557	0.0265
9	4.352	VV	0.3016	3.28639e5	1.61893e4	44.2515
10	5.281	VV	0.5502	1.10161e5	2624.54492	14.8333
11	6.354	VV	0.4762	2.96113e4	822.39856	3.9872
12	7.189	VV	0.7708	4.26822e4	688.42822	5.7472
13	8.556	VV	0.6224	4.55418e4	967.78729	6.1322
14	9.837	VV	0.6103	2.34286e4	519.57947	3.1547
15	10.836	VV	0.4952	1.99160e4	571.36377	2.6817
16	11.471	VV	0.4789	2.11326e4	617.92371	2.8455
17	11.984	VV	0.5545	1.97035e4	426.20682	2.6531
18	13.098	VV	0.4473	1.03073e4	337.26138	1.3879
19	14.287	VV	1.2999	6.93598e4	691.42419	9.3393
20	17.312	VV	0.3813	4580.92969	147.71004	0.6168
21	17.730	VV	0.0721	674.89471	120.04089	0.0909
22	17.867	VV	0.1075	1048.14966	118.50311	0.1411
23	18.068	VV	0.4417	4218.55615	113.08059	0.5680
24	19.692	VBA	0.9276	7293.03076	92.37045	0.9820
Totals :				7.42662e5	2.53467e4	

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\023-2301.D
Sample Name: D2-6

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  23
Acq. Instrument : Instrument 1                   Location : Vial 23
Injection Date  : 6/16/2014 7:53:42 PM               Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.095 BB    0.3141  226.07442   10.54594  31.9926
   2   4.919 BB    0.3470   67.24717    2.71456   9.5164
   3   7.555 BB    0.3163   44.36074    2.08465   6.2776
   4   8.920 BB    0.3801   69.11719    2.70462   9.7810
   5  12.895 BB    0.3883  299.84735   11.72781  42.4324

Totals :                   706.64686   29.77759
```

Signal 2: RID1 A, Refractive Index Signal

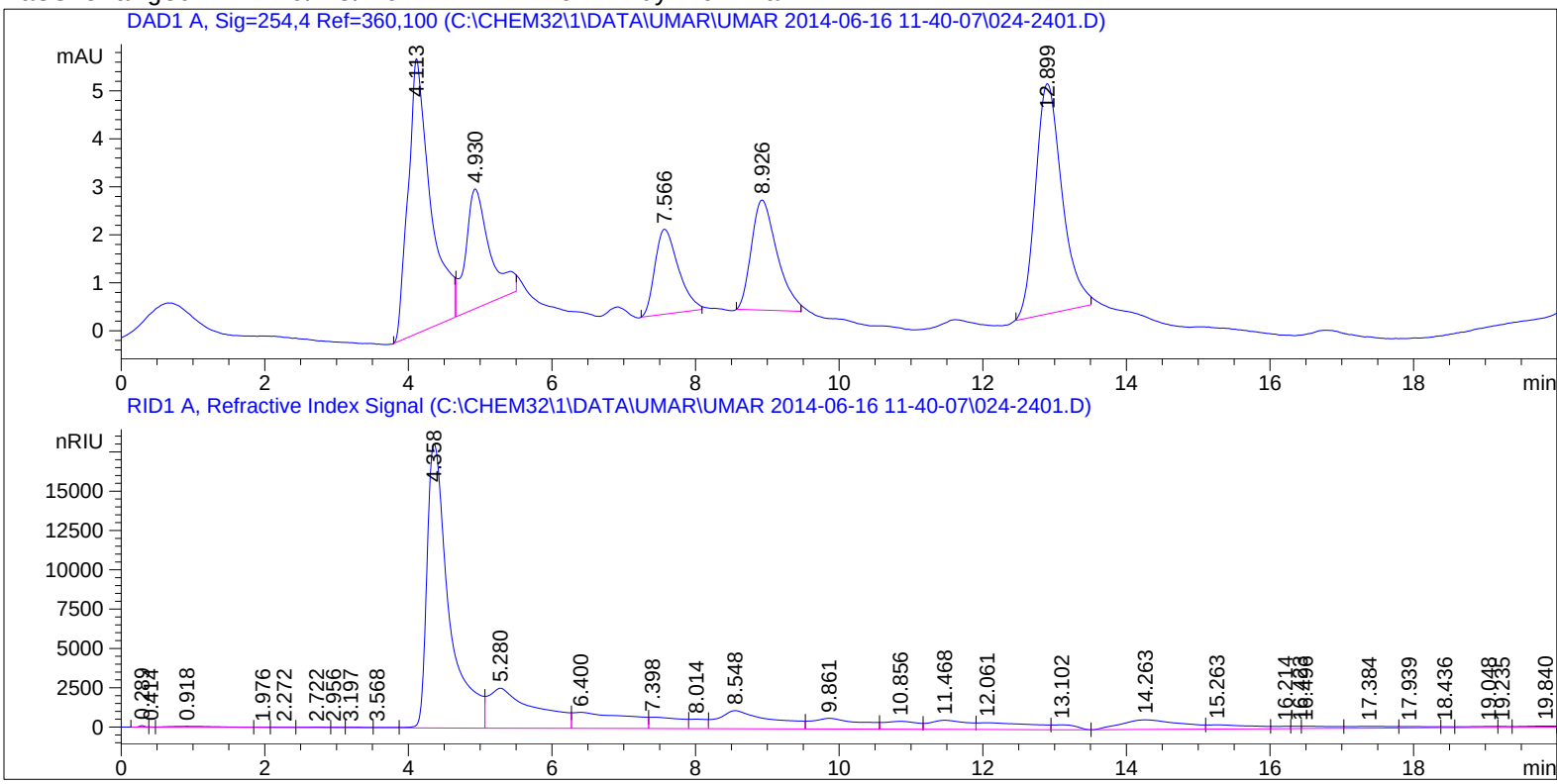
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.086	BV	0.0725	27.28952	5.34611	3.773e-3
2	0.290	VV	0.0877	612.36011	104.61567	0.0847
3	0.925	VV	0.6765	6753.19873	121.10455	0.9337
4	2.592	VV	0.2900	948.89050	39.04316	0.1312
5	2.779	VV	0.1636	520.70068	42.14472	0.0720
6	2.927	VV	0.4338	1555.18738	43.11432	0.2150
7	3.600	VV	0.2513	637.78333	30.65772	0.0882
8	4.346	VV	0.2968	3.23859e5	1.61335e4	44.7782
9	5.291	VV	0.5272	9.74085e4	2412.49902	13.4681
10	6.418	VV	0.6458	4.08080e4	810.33893	5.6423
11	7.444	VV	0.4228	1.91533e4	605.89069	2.6482
12	8.001	VV	0.3226	1.21259e4	535.27869	1.6766
13	8.545	VV	0.5694	4.77604e4	1108.98901	6.6036
14	9.859	VV	0.5272	3.93580e4	1026.55933	5.4418
15	10.840	VV	0.4312	1.43187e4	472.58640	1.9798
16	11.477	VV	0.5279	2.22911e4	583.34265	3.0821
17	12.024	VV	0.3850	1.10120e4	383.12799	1.5226
18	12.568	VV	0.2015	3668.70435	256.33600	0.5073
19	13.155	VV	0.4166	1.38059e4	507.64542	1.9089
20	14.260	VV	0.9269	4.29637e4	607.28217	5.9404
21	15.829	VV	0.5169	7337.49072	170.59102	1.0145
22	16.704	VV	0.3352	3131.73755	111.89100	0.4330
23	17.312	VV	0.1651	1239.03552	92.37733	0.1713
24	17.464	VV	0.2681	1886.92896	90.88923	0.2609
25	18.148	VV	0.3314	2592.32007	92.46339	0.3584
26	18.475	VV	0.3054	2151.50513	85.83853	0.2975
27	18.997	VV	0.4630	2959.14966	77.45451	0.4091
28	19.746	VBA	0.4230	2364.97729	67.64769	0.3270
Totals :				7.23252e5	2.66186e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\024-2401.D
Sample Name: D2-7

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  24
Acq. Instrument : Instrument 1                   Location : Vial 24
Injection Date  : 6/16/2014 8:16:02 PM                Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.113 BB    0.2839  123.81387    5.73458  30.7600
   2   4.930 BB    0.3330   58.42262    2.49640  14.5144
   3   7.566 BB    0.3419   40.04633    1.77044   9.9490
   4   8.926 BB    0.3617   56.98671    2.29466  14.1576
   5  12.899 BB    0.3876  123.24641    4.79984  30.6190

Totals :                   402.51593   17.09593
```

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\024-2401.D
Sample Name: D2-7

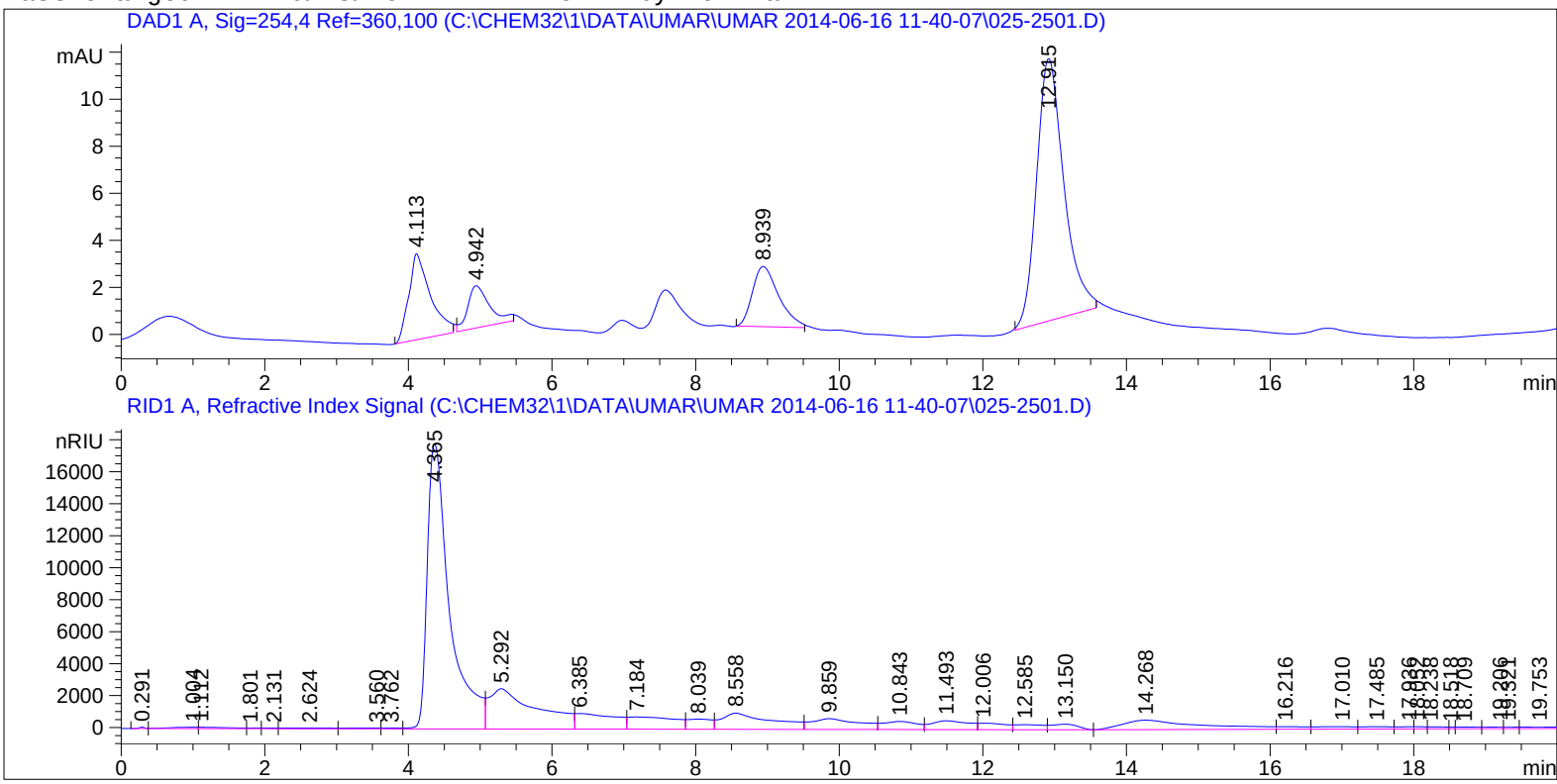
Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.289	VV	0.0794	479.62830	93.36853	0.0582
2	0.414	VV	0.0718	71.27583	13.17554	8.651e-3
3	0.918	VV	0.5881	2932.67090	59.26942	0.3559
4	1.976	VV	0.1526	218.93048	17.22092	0.0266
5	2.272	VV	0.2339	440.38870	22.59152	0.0535
6	2.722	VV	0.3117	869.20532	33.94315	0.1055
7	2.956	VV	0.1495	365.79282	30.30454	0.0444
8	3.197	VV	0.2712	721.66833	33.16290	0.0876
9	3.568	VV	0.2583	674.52783	31.79290	0.0819
10	4.358	VV	0.3159	3.85560e5	1.80709e4	46.7959
11	5.280	VV	0.5856	1.16212e5	2540.18848	14.1048
12	6.400	VV	0.6819	5.49634e4	1017.67432	6.6710
13	7.398	VV	0.4073	2.22561e4	721.71130	2.7013
14	8.014	VV	0.2309	9947.15625	604.48816	1.2073
15	8.548	VV	0.6684	5.90705e4	1154.15759	7.1695
16	9.861	VV	0.6289	3.24207e4	680.98059	3.9349
17	10.856	VV	0.4749	1.64727e4	503.09784	1.9993
18	11.468	VV	0.5091	2.13036e4	579.10315	2.5856
19	12.061	VV	0.6829	2.29568e4	428.83047	2.7863
20	13.102	VV	0.3548	7085.17627	307.99213	0.8599
21	14.263	VV	0.8113	3.57236e4	613.36157	4.3358
22	15.263	VV	0.5245	1.15634e4	268.26880	1.4035
23	16.214	VV	0.2105	2493.39209	148.91888	0.3026
24	16.423	VV	0.1163	1288.31079	145.42366	0.1564
25	16.496	VV	0.3693	4493.43457	144.50821	0.5454
26	17.384	VV	0.5001	4851.20459	115.17292	0.5888
27	17.939	VV	0.3831	2687.51001	86.21282	0.3262
28	18.436	VV	0.1383	671.68787	59.46270	0.0815
29	19.048	VV	0.3993	2145.30225	63.71761	0.2604
30	19.235	VV	0.1402	664.67712	58.00581	0.0807
31	19.840	VBA	0.3892	2313.03906	70.91604	0.2807
Totals :				8.23918e5	2.87180e4	

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\025-2501.D
Sample Name: D2-8

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  25
Acq. Instrument : Instrument 1                   Location : Vial 25
Injection Date  : 6/16/2014 8:38:23 PM                Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.113 BB    0.2724   76.01191    3.65802  16.0134
   2   4.942 BB    0.3158   38.43637    1.79504   8.0974
   3   8.939 BB    0.3752   65.19674    2.55908  13.7350
   4  12.915 BB    0.4024  295.03143   11.15970  62.1542

Totals :                   474.67646   19.17183
```

Signal 2: RID1 A, Refractive Index Signal

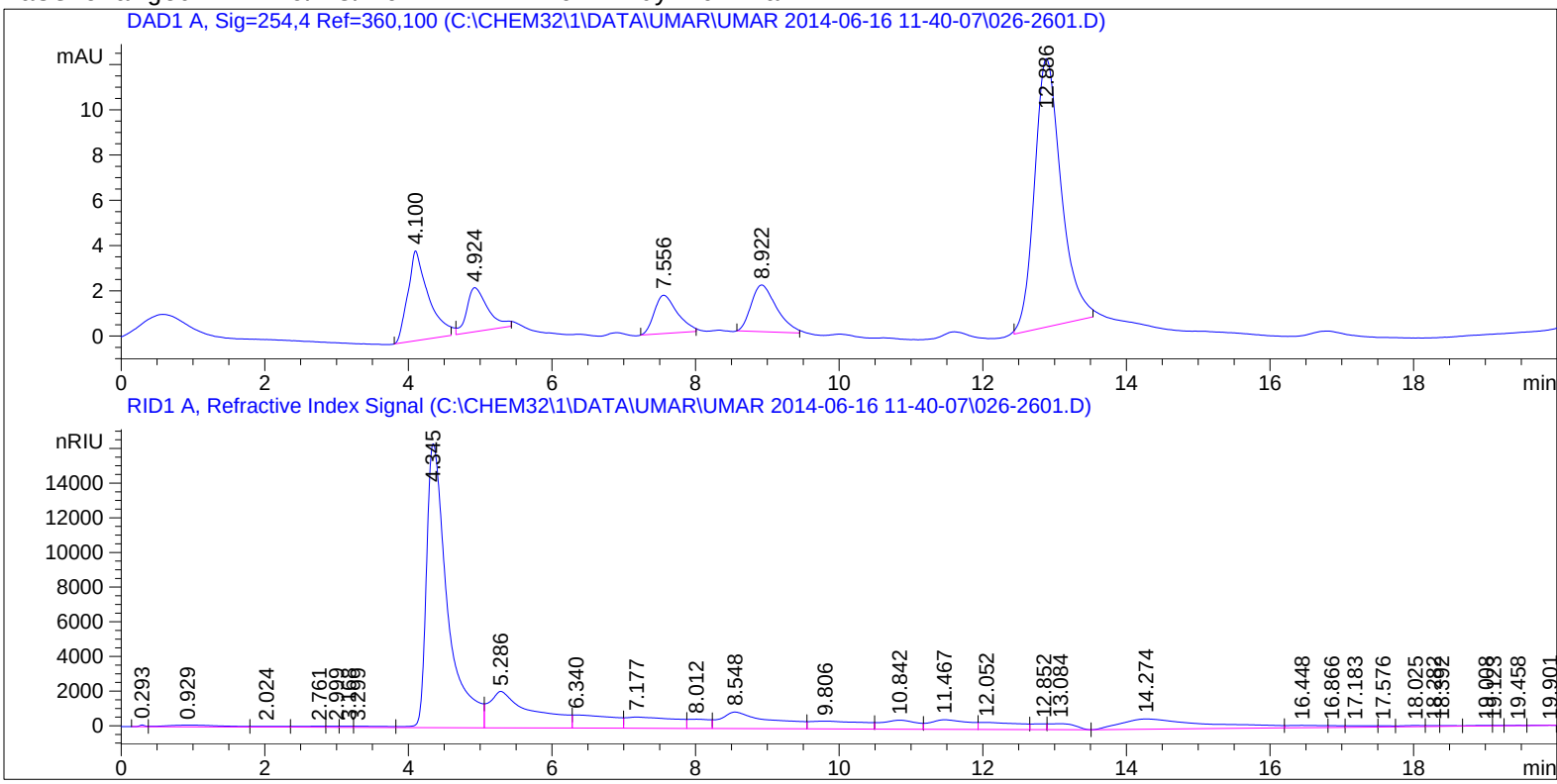
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.291	VV	0.0770	437.73065	88.73608	0.0534
2	1.004	VV	0.3256	2302.40356	84.74197	0.2807
3	1.112	VV	0.3739	2598.94214	85.01380	0.3168
4	1.801	VV	0.1487	503.72412	41.30933	0.0614
5	2.131	VV	0.1728	605.91821	43.64784	0.0739
6	2.624	VV	0.5394	2370.63232	51.89946	0.2890
7	3.560	VV	0.3856	1768.79834	54.43534	0.2156
8	3.762	VV	0.2153	1021.08856	57.05476	0.1245
9	4.365	VV	0.3191	3.85471e5	1.78339e4	46.9918
10	5.292	VV	0.5977	1.16679e5	2523.60352	14.2240
11	6.385	VV	0.5022	3.72061e4	973.14697	4.5357
12	7.184	VV	0.5695	3.43416e4	764.42334	4.1865
13	8.039	VV	0.3307	1.48413e4	635.76532	1.8093
14	8.558	VV	0.6417	4.96674e4	1011.93225	6.0548
15	9.859	VV	0.6159	3.12165e4	674.11670	3.8055
16	10.843	VV	0.4708	1.66049e4	506.77567	2.0243
17	11.493	VV	0.5096	2.00819e4	550.77167	2.4481
18	12.006	VV	0.3354	1.06491e4	404.27216	1.2982
19	12.585	VV	0.3465	8647.18359	312.58487	1.0542
20	13.150	VV	0.3837	8891.67285	346.44998	1.0840
21	14.268	VV	1.0099	4.50431e4	594.07666	5.4911
22	16.216	VV	0.3299	4438.02588	160.09901	0.5410
23	17.010	VV	0.4683	5669.74414	147.37840	0.6912
24	17.485	VV	0.3623	4170.08008	143.72324	0.5084
25	17.936	VV	0.2000	2174.29907	134.05823	0.2651
26	18.052	VV	0.1376	1458.16541	131.95152	0.1778
27	18.238	VV	0.2095	2170.38550	126.07976	0.2646
28	18.518	VV	0.0661	586.87689	110.83779	0.0715
29	18.709	VV	0.2575	2317.19507	109.59450	0.2825
30	19.206	VV	0.2083	1863.56873	107.73621	0.2272
31	19.321	VV	0.1728	1383.33081	106.75200	0.1686
32	19.753	VBA	0.3645	3112.49585	102.04060	0.3794
Totals :				8.20294e5	2.90190e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\026-2601.D
Sample Name: D2-9

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  26
Acq. Instrument : Instrument 1                   Location : Vial 26
Injection Date  : 6/16/2014 9:00:46 PM                Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.100 BB    0.2584   78.45357    3.97189  15.3178
   2   4.924 BB    0.2943   39.80618    1.94882   7.7720
   3   7.556 BB    0.3243   37.51073    1.69402   7.3238
   4   8.922 BB    0.3577   50.47155    2.06113   9.8544
   5  12.886 BB    0.3909  305.93137   11.86304  59.7320

Totals :                   512.17339   21.53890
```

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\026-2601.D
Sample Name: D2-9

Signal 2: RID1 A, Refractive Index Signal

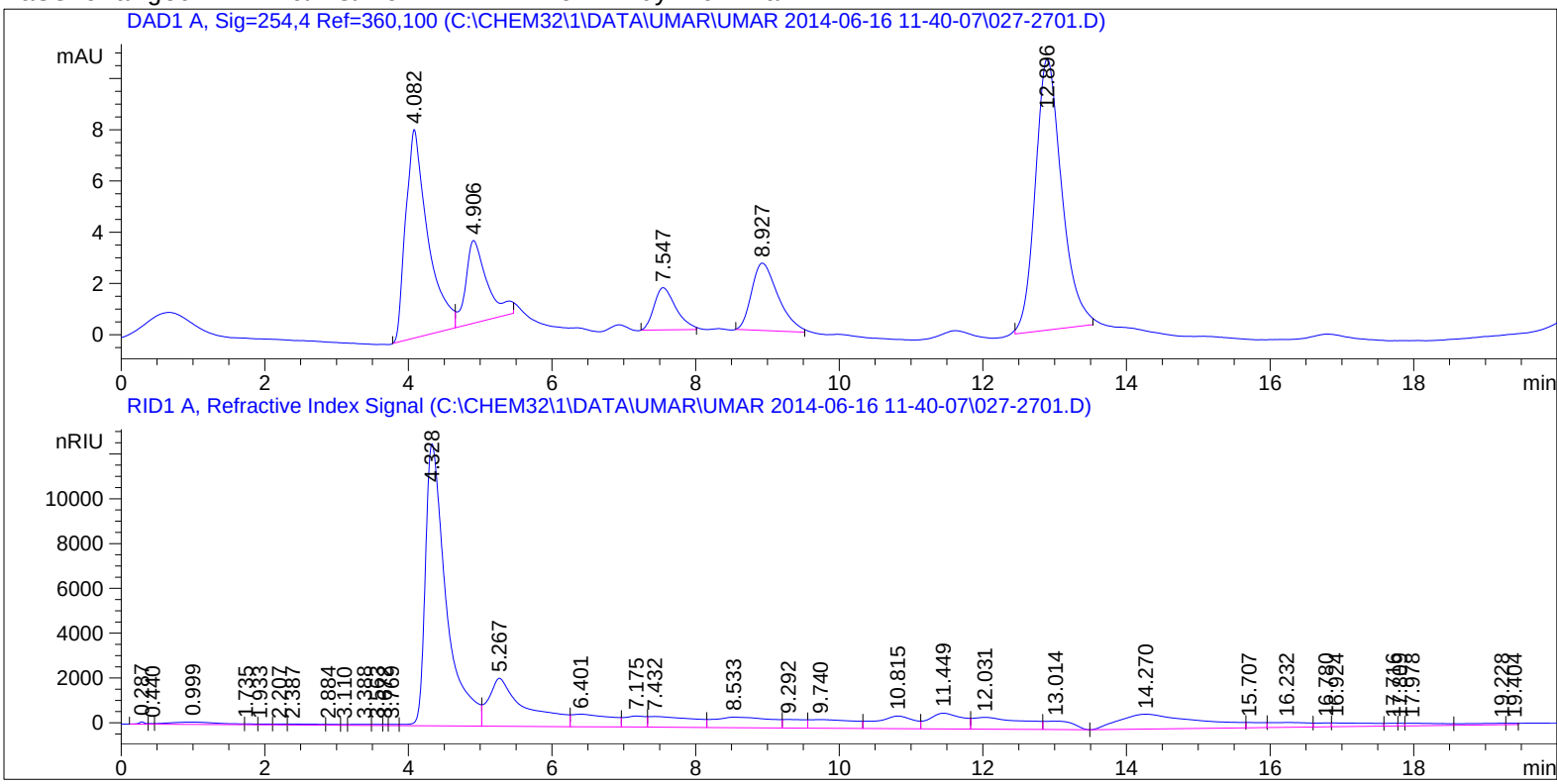
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.293	VV	0.0803	482.24979	92.40237	0.0684
2	0.929	VV	0.6493	5103.81104	93.57309	0.7237
3	2.024	VV	0.3863	1312.98083	40.33239	0.1862
4	2.761	VV	0.3136	1428.45386	54.25873	0.2025
5	2.999	VV	0.1341	635.80493	59.11139	0.0902
6	3.168	VV	0.1501	746.52911	62.50589	0.1059
7	3.299	VV	0.3869	2113.12939	64.81202	0.2996
8	4.345	VV	0.3014	3.32143e5	1.63799e4	47.0951
9	5.286	VV	0.5485	8.91748e4	2104.02563	12.6442
10	6.340	VV	0.4987	2.93979e4	752.98370	4.1684
11	7.177	VV	0.6054	3.10626e4	647.12091	4.4044
12	8.012	VV	0.2878	1.11277e4	535.38953	1.5778
13	8.548	VV	0.6521	4.73738e4	955.20636	6.7172
14	9.806	VV	0.6565	2.32699e4	448.97797	3.2995
15	10.842	VV	0.4745	1.74985e4	517.40845	2.4811
16	11.467	VV	0.5248	2.07848e4	550.41394	2.9471
17	12.052	VV	0.4978	1.57916e4	405.30515	2.2391
18	12.852	VV	0.1758	4732.69482	330.24133	0.6711
19	13.084	VV	0.3784	8734.44141	343.83456	1.2385
20	14.274	VV	1.0612	4.90459e4	593.59973	6.9543
21	16.448	VV	0.4074	4602.69678	136.15059	0.6526
22	16.866	VV	0.1673	1383.86768	101.74954	0.1962
23	17.183	VV	0.3119	2195.42505	85.66626	0.3113
24	17.576	VV	0.1668	926.69385	67.43195	0.1314
25	18.025	VV	0.2897	1492.48547	64.93729	0.2116
26	18.282	VV	0.1462	630.26874	52.61687	0.0894
27	18.392	VV	0.1921	703.32373	46.94450	0.0997
28	19.008	VV	0.2877	726.86127	31.35891	0.1031
29	19.123	VV	0.1075	197.78589	24.40862	0.0280
30	19.458	VV	0.2135	269.26114	15.49435	0.0382
31	19.901	VBA	0.3366	171.78363	6.23419	0.0244
Totals :				7.05261e5	2.56644e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\027-2701.D
Sample Name: D3-1

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  27
Acq. Instrument : Instrument 1                  Location : Vial 27
Injection Date  : 6/16/2014 9:23:04 PM               Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.082 BB    0.2810  173.78751    8.14214  28.3535
   2   4.906 BB    0.2975   67.43452    3.23137  11.0020
   3   7.547 BB    0.3115   34.64403    1.64654   5.6522
   4   8.927 BB    0.3865   67.20192    2.62636  10.9640
   5  12.896 BB    0.3871  269.86237   10.59870  44.0282

Totals :                   612.93034   26.24511
```

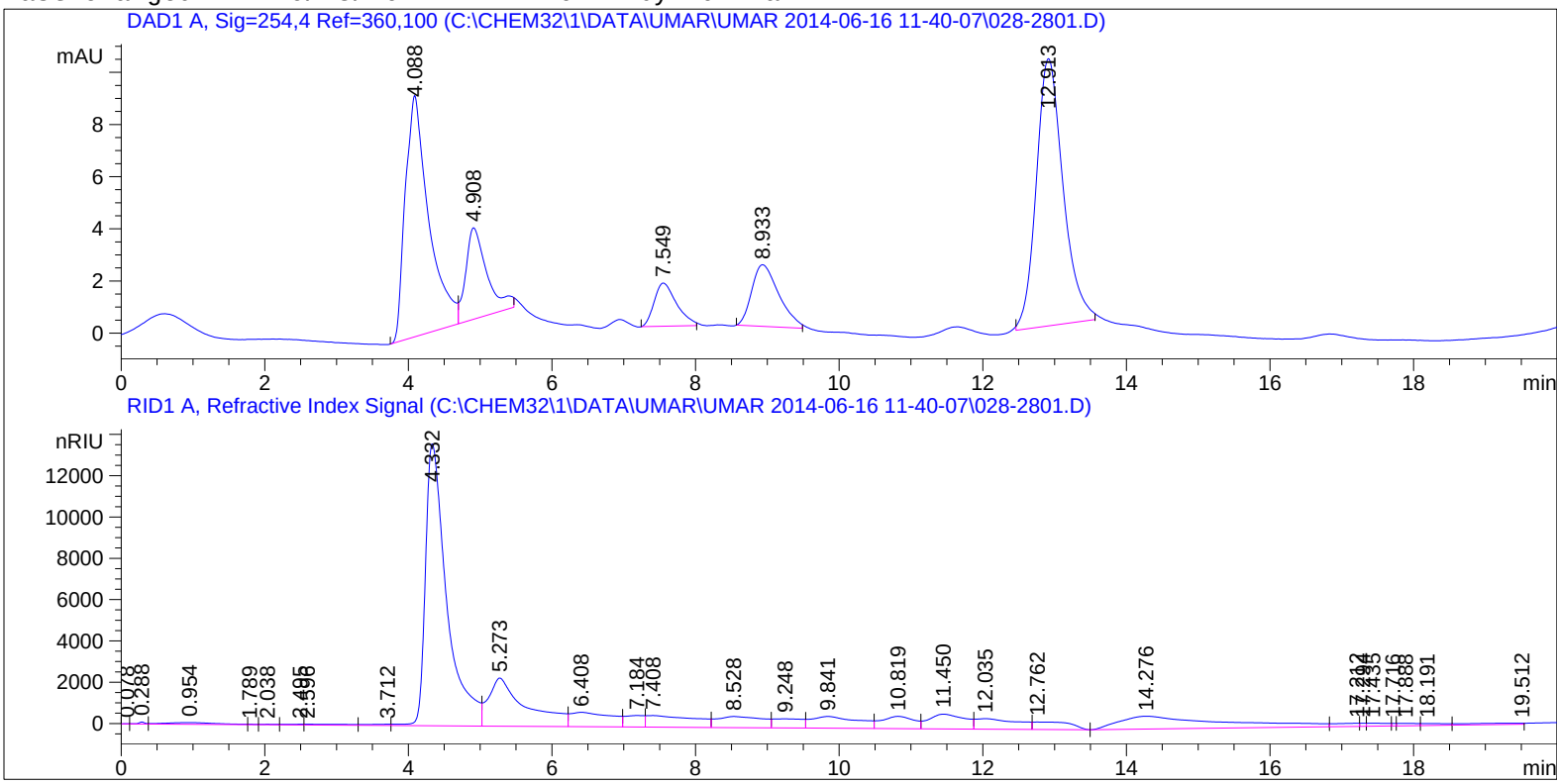
Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.287	BV	0.0855	534.62073	94.44555	0.0885
2	0.440	VV	0.0721	143.68677	28.32956	0.0238
3	0.999	VV	0.5864	5053.09375	104.37403	0.8361
4	1.735	VV	0.1828	410.58813	37.43763	0.0679
5	1.933	VV	0.1503	444.84052	36.62465	0.0736
6	2.207	VV	0.1542	470.91095	38.90670	0.0779
7	2.387	VV	0.3771	1289.50354	41.07479	0.2134
8	2.884	VV	0.1445	495.78928	41.26637	0.0820
9	3.110	VV	0.0741	223.57162	38.57518	0.0370
10	3.388	VV	0.2299	895.39154	47.67652	0.1482
11	3.563	VV	0.1173	475.20639	51.04215	0.0786
12	3.672	VV	0.0602	238.47392	51.75392	0.0395
13	3.769	VV	0.1110	491.89459	53.78717	0.0814
14	4.328	VV	0.2978	2.53670e5	1.25870e4	41.9724
15	5.267	VV	0.4677	7.63081e4	2140.86377	12.6260
16	6.401	VV	0.4891	2.10734e4	559.52332	3.4868
17	7.175	VV	0.2852	1.01193e4	492.28497	1.6743
18	7.432	VV	0.5439	2.08848e4	476.32452	3.4556
19	8.533	VV	0.6966	2.60135e4	469.16055	4.3042
20	9.292	VV	0.2645	8014.95654	378.19312	1.3262
21	9.740	VV	0.5296	1.63864e4	384.50827	2.7113
22	10.815	VV	0.4980	2.02529e4	562.31897	3.3510
23	11.449	VV	0.4657	2.29264e4	701.23169	3.7934
24	12.031	VV	0.6295	2.59679e4	526.42932	4.2967
25	13.014	VV	0.4293	1.04358e4	373.87939	1.7267
26	14.270	VV	1.0107	5.05097e4	665.51733	8.3574
27	15.707	VV	0.2129	4070.98267	237.60048	0.6736
28	16.232	VV	0.4338	7958.88184	216.21684	1.3169
29	16.780	VV	0.1867	2673.13550	173.03566	0.4423
30	16.924	VV	0.4684	6434.26563	167.19786	1.0646
31	17.716	VV	0.1469	1435.82812	123.11366	0.2376
32	17.809	VV	0.0716	683.16345	118.48470	0.1130
33	17.978	VV	0.4060	3890.59717	113.01434	0.6437
34	19.228	VV	0.5368	2863.95435	63.78165	0.4739
35	19.404	VV	0.1288	632.62274	60.34127	0.1047
Totals :				6.04374e5	2.22553e4	

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\028-2801.D
Sample Name: D3-2

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  28
Acq. Instrument : Instrument 1                   Location : Vial 28
Injection Date  : 6/16/2014 9:45:25 PM               Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.088 BB    0.2990  210.14113    9.25063  32.5851
   2   4.908 BB    0.2925   71.68518    3.50600  11.1157
   3   7.549 BB    0.3222   35.72474    1.65278   5.5396
   4   8.933 BB    0.3834   61.77810    2.36010   9.5795
   5  12.913 BB    0.3944  265.57086   10.24688  41.1802

Totals :                   644.90001   27.01638
```

Signal 2: RID1 A, Refractive Index Signal

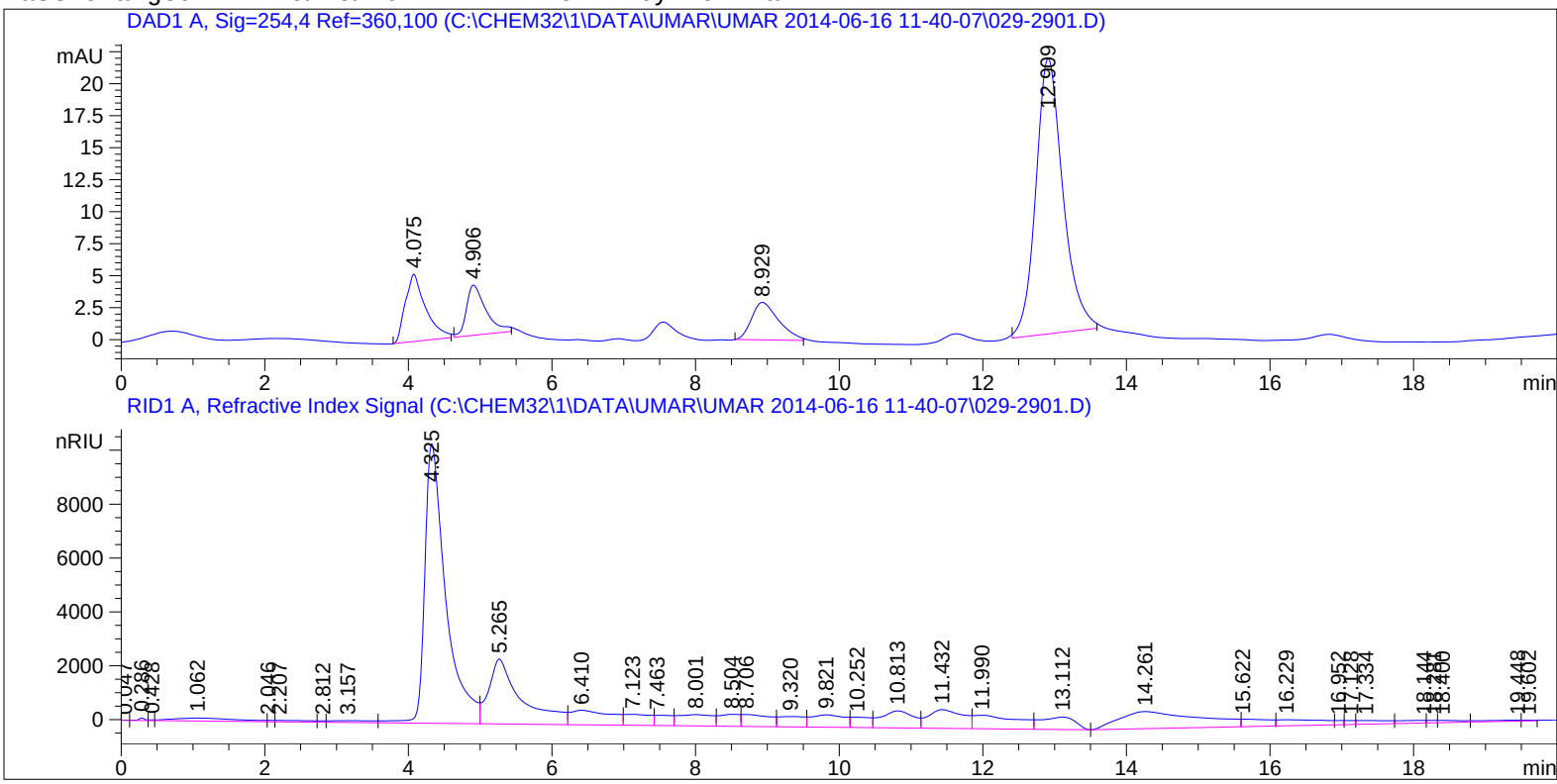
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.078	BV	0.0708	31.63847	5.93767	4.831e-3
2	0.288	VV	0.0887	555.74231	93.62705	0.0849
3	0.954	VV	0.5785	3969.86987	82.21394	0.6062
4	1.789	VV	0.1126	160.05139	18.33855	0.0244
5	2.038	VV	0.2092	385.83362	22.44031	0.0589
6	2.495	VV	0.2160	581.67535	32.72947	0.0888
7	2.596	VV	0.5682	1694.42517	35.19192	0.2587
8	3.712	VV	0.2793	1330.69104	59.74266	0.2032
9	4.332	VV	0.3070	2.80932e5	1.36541e4	42.8956
10	5.273	VV	0.4683	8.36066e4	2329.99683	12.7659
11	6.408	VV	0.5114	2.73955e4	695.49451	4.1830
12	7.184	VV	0.2587	1.02667e4	555.82697	1.5676
13	7.408	VV	0.5830	2.62992e4	559.43225	4.0156
14	8.528	VV	0.5691	2.36488e4	537.87415	3.6109
15	9.248	VV	0.3457	1.23967e4	437.55508	1.8929
16	9.841	VV	0.6061	2.58293e4	568.08167	3.9439
17	10.819	VV	0.4478	1.84949e4	593.42816	2.8240
18	11.450	VV	0.4892	2.49147e4	713.96362	3.8042
19	12.035	VV	0.5265	2.05512e4	507.48630	3.1380
20	12.762	VV	0.4375	1.31965e4	358.97345	2.0150
21	14.276	VV	1.2984	6.26540e4	623.09814	9.5667
22	17.212	VV	0.2969	3714.32910	150.31894	0.5671
23	17.294	VV	0.0741	823.30060	146.83397	0.1257
24	17.435	VV	0.2414	2812.70581	140.98758	0.4295
25	17.716	VV	0.0520	488.71402	119.62608	0.0746
26	17.888	VV	0.2456	2217.57422	114.39064	0.3386
27	18.191	VV	0.2861	2278.75757	96.55267	0.3479
28	19.512	VV	0.8272	3689.08911	52.57890	0.5633
Totals :				6.54920e5	2.33068e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\029-2901.D
Sample Name: D3-3

```
=====================================================================
Acq. Operator   : umar                          Seq. Line :  29
Acq. Instrument : Instrument 1                   Location : Vial 29
Injection Date  : 6/16/2014 10:07:47 PM               Inj :   1
                                                Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.075 BB    0.2613  103.24792    5.25414  12.6231
   2   4.906 BB    0.2721   74.00566    3.92361   9.0479
   3   8.929 BB    0.3881   76.75617    2.92570   9.3842
   4  12.909 BB    0.3959  563.92084   21.50812  68.9448

Totals :                   817.93060   33.61157
```

Signal 2: RID1 A, Refractive Index Signal

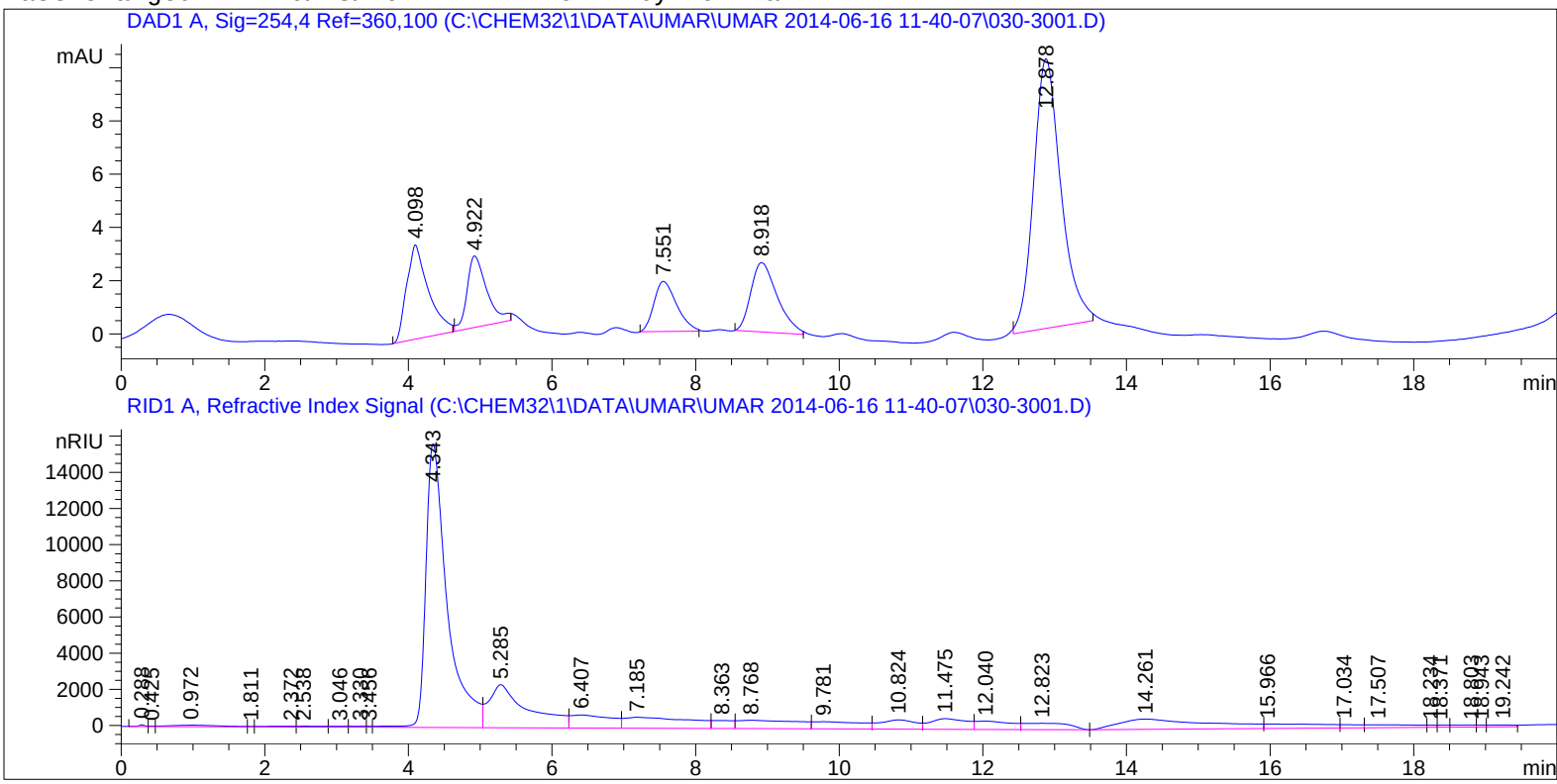
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.047	BV	0.0910	14.76800	2.20795	2.621e-3
2	0.286	VV	0.0866	522.62280	90.73845	0.0927
3	0.428	VV	0.0760	131.60342	25.20574	0.0234
4	1.062	VV	0.7459	6953.02686	110.99565	1.2339
5	2.046	VV	0.1096	313.79959	47.70686	0.0557
6	2.207	VV	0.4175	1826.83130	51.85526	0.3242
7	2.812	VV	0.0955	406.91910	54.66211	0.0722
8	3.157	VV	0.4996	2883.56714	68.22013	0.5117
9	4.325	VV	0.2976	2.10974e5	1.03811e4	37.4408
10	5.265	VV	0.4174	7.55280e4	2410.70972	13.4037
11	6.410	VV	0.5064	2.11749e4	540.87115	3.7578
12	7.123	VV	0.3326	1.01668e4	406.75369	1.8043
13	7.463	VV	0.1973	6292.44434	380.45010	1.1167
14	8.001	VV	0.4314	1.39821e4	420.24963	2.4814
15	8.504	VV	0.2695	8772.15527	443.67319	1.5568
16	8.706	VV	0.3621	1.19562e4	440.34924	2.1218
17	9.320	VV	0.3082	9489.19727	383.32837	1.6840
18	9.821	VV	0.4434	1.48844e4	458.63864	2.6415
19	10.252	VV	0.2319	7131.28857	379.98007	1.2656
20	10.813	VV	0.4369	1.95541e4	631.41559	3.4702
21	11.432	VV	0.4746	2.35962e4	693.61975	4.1875
22	11.990	VV	0.5541	2.12268e4	499.55591	3.7671
23	13.112	VV	0.4809	1.51318e4	460.05234	2.6854
24	14.261	VV	0.9996	4.93706e4	635.27344	8.7616
25	15.622	VV	0.3124	7347.71777	280.23526	1.3040
26	16.229	VV	0.5188	9718.97168	224.14748	1.7248
27	16.952	VV	0.0969	1228.11206	154.80861	0.2179
28	17.128	VV	0.1200	1417.52295	145.70178	0.2516
29	17.334	VV	0.3599	4055.83228	135.54958	0.7198
30	18.144	VV	0.3420	2681.21899	95.07532	0.4758
31	18.281	VV	0.1200	837.32141	89.45088	0.1486
32	18.400	VV	0.2725	1865.45898	83.15959	0.3311
33	19.448	VB	0.5604	1687.45728	35.40472	0.2995
34	19.602	BV	0.1601	362.91043	27.95392	0.0644
Totals :				5.63486e5	2.12891e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\030-3001.D
Sample Name: D3-4

```
==========================================================================
Acq. Operator   : umar                              Seq. Line :  30
Acq. Instrument : Instrument 1                       Location : Vial 30
Injection Date  : 6/16/2014 10:30:10 PM                  Inj :   1
                                                   Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.098 BB    0.2782   74.79498    3.54426  14.8852
   2   4.922 BB    0.2822   51.65848    2.68760  10.2807
   3   7.551 BB    0.3262   41.37721    1.88426   8.2346
   4   8.918 BB    0.3786   66.61814    2.60308  13.2579
   5  12.878 BB    0.4005  268.02960   10.13528  53.3415

Totals :                   502.47841   20.85448
```

Signal 2: RID1 A, Refractive Index Signal

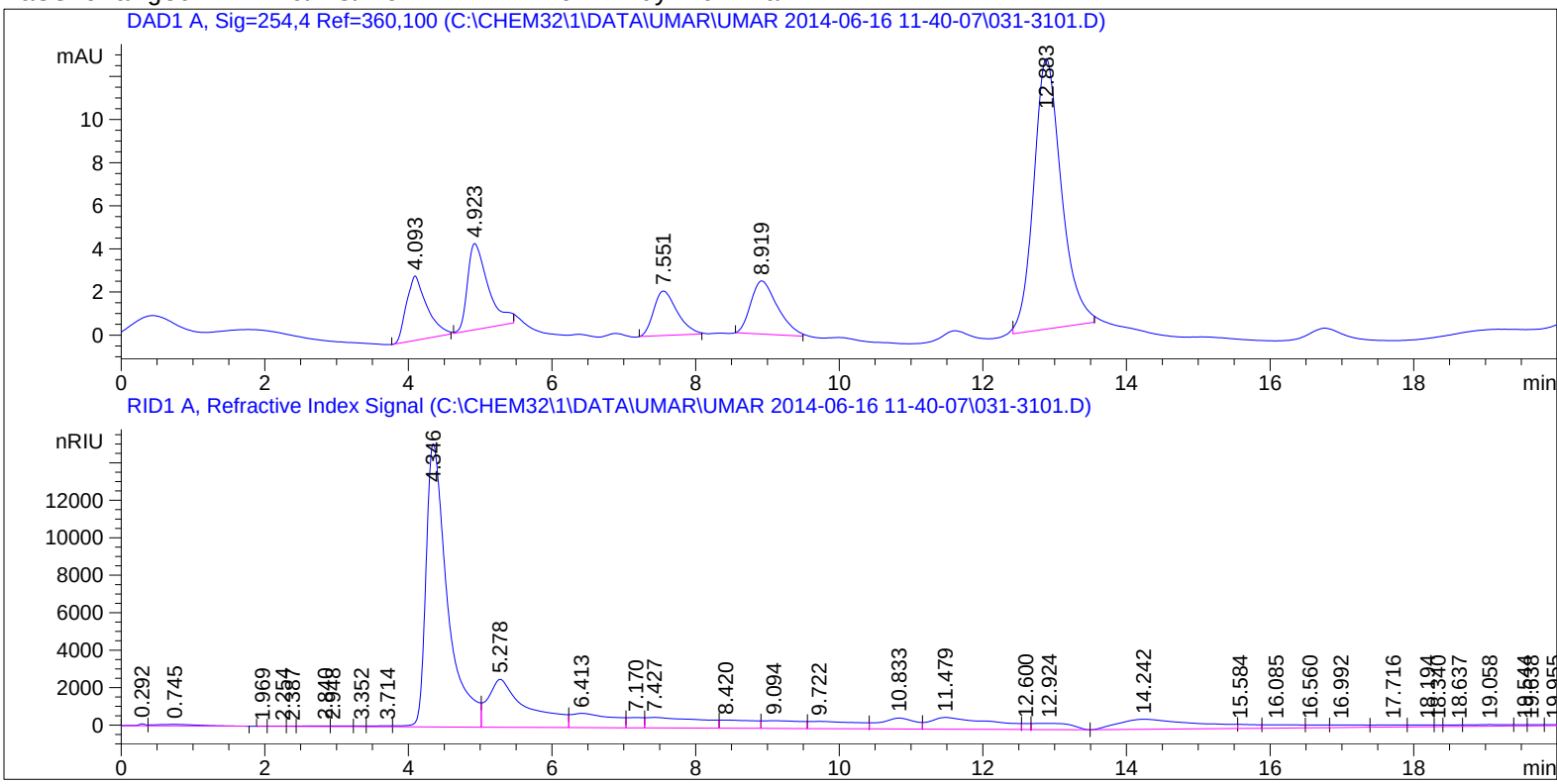
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.288	VV	0.0845	503.96555	90.42793	0.0723
2	0.425	VV	0.0794	128.33224	22.54174	0.0184
3	0.972	VV	0.5977	4022.15576	80.85247	0.5773
4	1.811	VV	0.0792	132.44188	23.34318	0.0190
5	2.372	VV	0.3387	1254.96252	44.94260	0.1801
6	2.538	VV	0.3291	1313.97107	48.82894	0.1886
7	3.046	VV	0.1999	887.17017	53.50573	0.1273
8	3.330	VV	0.1738	861.33508	59.29262	0.1236
9	3.456	VV	0.0702	303.42450	59.57877	0.0435
10	4.343	VV	0.3055	3.23634e5	1.56871e4	46.4492
11	5.285	VV	0.4906	8.96490e4	2383.95386	12.8668
12	6.407	VV	0.5120	2.80113e4	720.29675	4.0203
13	7.185	VV	0.7951	3.88473e4	604.50403	5.5755
14	8.363	VV	0.2480	8767.49316	439.24939	1.2583
15	8.768	VV	0.7156	2.70389e4	461.72577	3.8807
16	9.781	VV	0.5892	1.84568e4	394.40164	2.6490
17	10.824	VV	0.4837	1.75173e4	511.57922	2.5141
18	11.475	VV	0.4898	2.08470e4	587.14874	2.9920
19	12.040	VV	0.4577	1.57313e4	457.07697	2.2578
20	12.823	VV	0.5355	1.55979e4	348.25522	2.2387
21	14.261	VV	1.1418	4.99883e4	570.11139	7.1745
22	15.966	VV	0.6791	1.40417e4	245.14156	2.0153
23	17.034	VV	0.2463	3532.35742	185.17361	0.5070
24	17.507	VV	0.5687	7668.99023	160.99504	1.1007
25	18.234	VV	0.1124	1039.11487	121.92237	0.1491
26	18.371	VV	0.1338	1197.98438	115.64470	0.1719
27	18.803	VV	0.2681	2364.43774	106.31766	0.3394
28	18.943	VV	0.1064	860.56769	102.71577	0.1235
29	19.242	VV	0.3082	2548.83887	102.21218	0.3658
Totals :				6.96748e5	2.47889e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\031-3101.D
Sample Name: D3-5

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  31
Acq. Instrument : Instrument 1                   Location : Vial 31
Injection Date  : 6/16/2014 10:52:34 PM               Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.093 BB    0.2622   58.86829    2.98294  10.0648
   2   4.923 BB    0.3012   79.92078    3.99768  13.6641
   3   7.551 BB    0.3448   46.79638    2.06205   8.0008
   4   8.919 BB    0.3874   63.71351    2.46589  10.8932
   5  12.883 BB    0.4022  335.59528   12.54284  57.3771

Totals :                   584.89423   24.05140
```

Signal 2: RID1 A, Refractive Index Signal

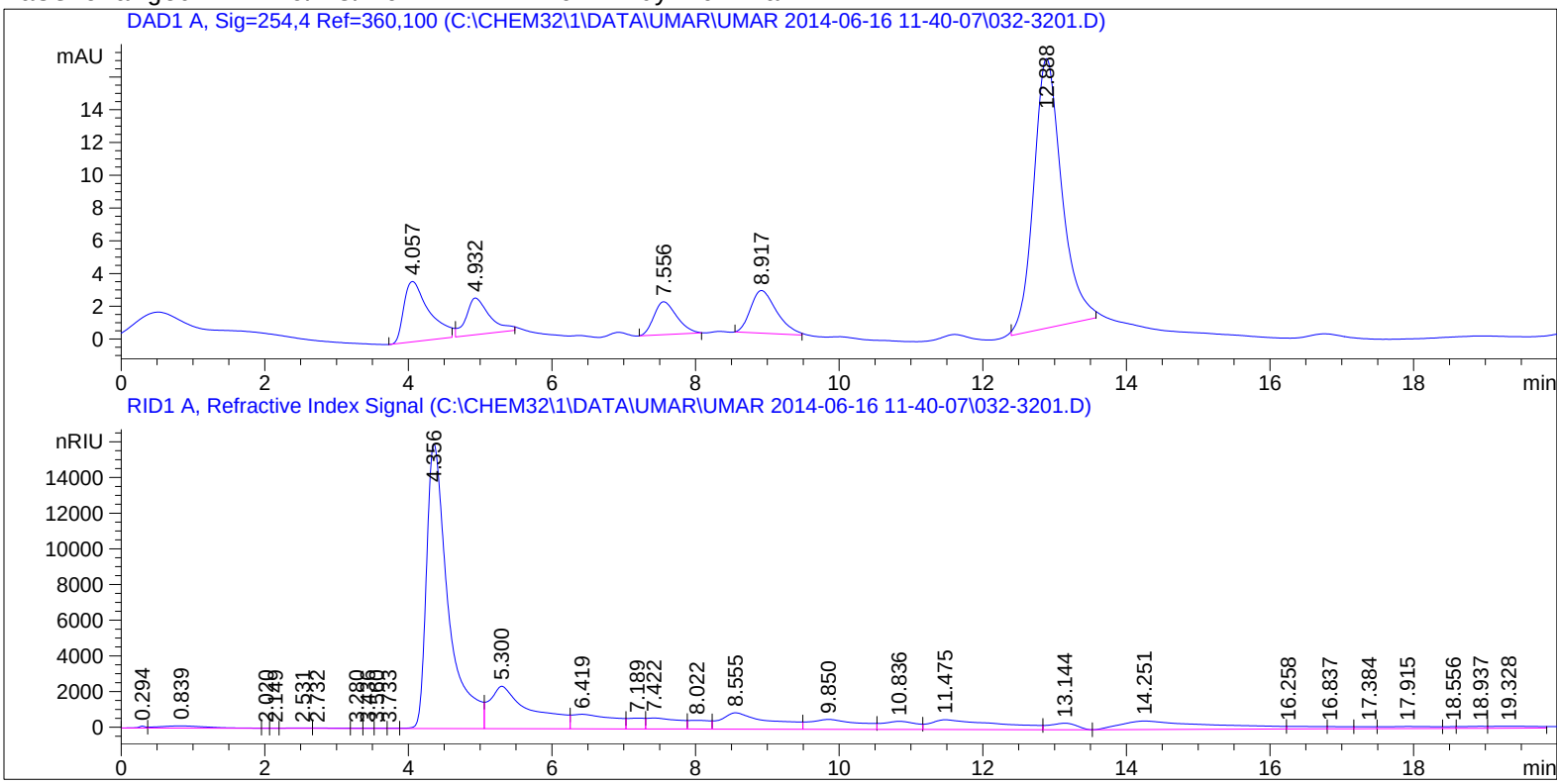
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.292	BV	0.1011	714.94257	102.14321	0.1054
2	0.745	VV	0.4922	3259.47314	77.95164	0.4805
3	1.969	VV	0.0987	36.02902	4.77964	5.312e-3
4	2.254	VV	0.1539	153.76680	12.17259	0.0227
5	2.387	VV	0.1003	118.12792	15.03568	0.0174
6	2.840	VV	0.2713	765.46942	33.45275	0.1129
7	2.948	VV	0.2313	667.08563	34.61211	0.0983
8	3.352	VV	0.1438	420.39740	40.86548	0.0620
9	3.714	VV	0.2396	1053.82617	52.73109	0.1554
10	4.346	VV	0.3090	3.13680e5	1.51185e4	46.2445
11	5.278	VV	0.5011	9.66422e4	2559.12939	14.2476
12	6.413	VV	0.5471	3.07650e4	761.29413	4.5356
13	7.170	VV	0.2122	8477.93359	550.11066	1.2499
14	7.427	VV	0.6881	3.04083e4	559.50714	4.4830
15	8.420	VV	0.4005	1.46257e4	433.01230	2.1562
16	9.094	VV	0.4624	1.53776e4	411.02969	2.2671
17	9.722	VV	0.5784	1.82682e4	385.76953	2.6932
18	10.833	VV	0.4642	1.95038e4	582.25299	2.8754
19	11.479	VV	0.7788	3.74968e4	625.94446	5.5280
20	12.600	VV	0.1009	2541.94458	321.32672	0.3747
21	12.924	VV	0.4462	1.22775e4	328.96606	1.8100
22	14.242	VV	0.9926	3.99012e4	538.08514	5.8825
23	15.584	VV	0.2368	4056.75586	215.64557	0.5981
24	16.085	VV	0.4191	6238.35742	179.18120	0.9197
25	16.560	VV	0.2400	2999.55200	154.16563	0.4422
26	16.992	VV	0.3908	4453.94141	139.11876	0.6566
27	17.716	VV	0.3632	3499.70068	114.46325	0.5159
28	18.194	VV	0.2733	2205.98804	96.46197	0.3252
29	18.340	VV	0.0957	661.94214	90.93402	0.0976
30	18.637	VV	0.1979	1398.94336	84.30167	0.2062
31	19.058	VV	0.4795	3470.49194	88.00822	0.5116
32	19.544	VV	0.1391	760.22302	66.89924	0.1121
33	19.638	VV	0.1660	859.62341	63.74542	0.1267
34	19.955	VBA	0.1406	545.91711	50.74296	0.0805
Totals :				6.78306e5	2.48923e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\032-3201.D
Sample Name: D3-6

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  32
Acq. Instrument : Instrument 1                   Location : Vial 32
Injection Date  : 6/16/2014 11:14:57 PM               Inj :   1
                                                Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.057 BB    0.3539   88.93071    3.68101  12.7842
   2   4.932 BB    0.3208   50.87178    2.24134   7.3131
   3   7.556 BB    0.3306   44.54119    2.00952   6.4030
   4   8.917 BB    0.3781   65.56534    2.60135   9.4253
   5  12.888 BB    0.4081  445.72067   16.45227  64.0744

Totals :                   695.62969   26.98548
```

Signal 2: RID1 A, Refractive Index Signal

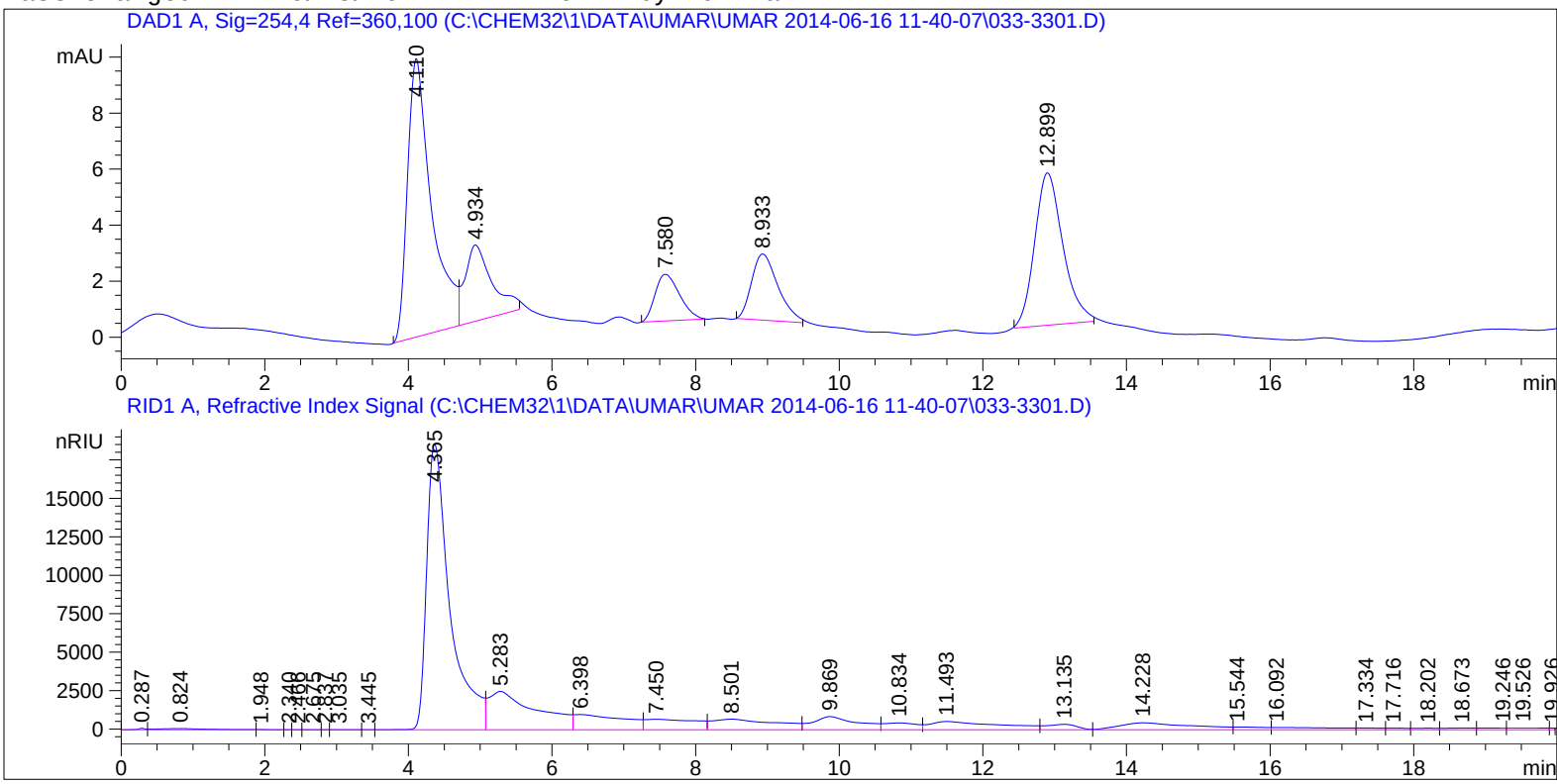
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.294	BV	0.0984	729.77405	104.95246	0.1029
2	0.839	VV	0.5882	5662.12939	120.72509	0.7981
3	2.020	VV	0.0856	47.09764	7.34581	6.638e-3
4	2.149	VV	0.0970	67.65367	8.93284	9.536e-3
5	2.531	VV	0.2736	394.42429	17.80021	0.0556
6	2.732	VV	0.3587	489.76590	16.52448	0.0690
7	3.280	VV	0.1335	151.47649	15.20750	0.0214
8	3.436	VV	0.1162	145.59343	15.79735	0.0205
9	3.560	VV	0.1317	169.93382	16.11273	0.0240
10	3.733	VV	0.1264	167.02756	15.96211	0.0235
11	4.356	VV	0.3105	3.36054e5	1.59602e4	47.3671
12	5.300	VV	0.5222	9.55081e4	2379.76123	13.4619
13	6.419	VV	0.5283	3.27220e4	816.09991	4.6122
14	7.189	VV	0.2237	9811.61914	605.26208	1.3830
15	7.422	VV	0.4180	1.91224e4	612.90460	2.6953
16	8.022	VV	0.2811	9988.73047	489.77951	1.4079
17	8.555	VV	0.6243	4.33868e4	915.32898	6.1154
18	9.850	VV	0.6328	2.65580e4	553.94189	3.7434
19	10.836	VV	0.4470	1.45763e4	455.21451	2.0545
20	11.475	VV	0.8544	3.67874e4	546.50525	5.1852
21	13.144	VV	0.3976	9621.59668	365.75430	1.3562
22	14.251	VV	1.1350	4.29876e4	479.28622	6.0591
23	16.258	VV	0.3727	4723.68408	149.60172	0.6658
24	16.837	VV	0.2516	2671.98242	126.05723	0.3766
25	17.384	VV	0.2371	2174.20825	113.17458	0.3065
26	17.915	VV	0.5922	5928.92139	117.66366	0.8357
27	18.556	VV	0.1465	1115.53235	99.06416	0.1572
28	18.937	VV	0.3076	2748.69531	110.45940	0.3874
29	19.328	VV	0.5454	4955.74463	108.58900	0.6985
Totals :				7.09469e5	2.53440e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\033-3301.D
Sample Name: D3-7

```
==========================================================================
Acq. Operator   : umar                              Seq. Line :  33
Acq. Instrument : Instrument 1                       Location : Vial 33
Injection Date  : 6/16/2014 11:37:21 PM                  Inj :   1
                                                   Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.110 BB    0.3336  229.63625    9.93820  41.8399
   2   4.934 BB    0.3673   70.72145    2.72070  12.8855
   3   7.580 BB    0.3589   39.51166    1.66470   7.1990
   4   8.933 BB    0.3818   60.19706    2.35835  10.9679
   5  12.899 BB    0.4073  148.77919    5.43604  27.1077

Totals :                   548.84560   22.11799
```

Signal 2: RID1 A, Refractive Index Signal

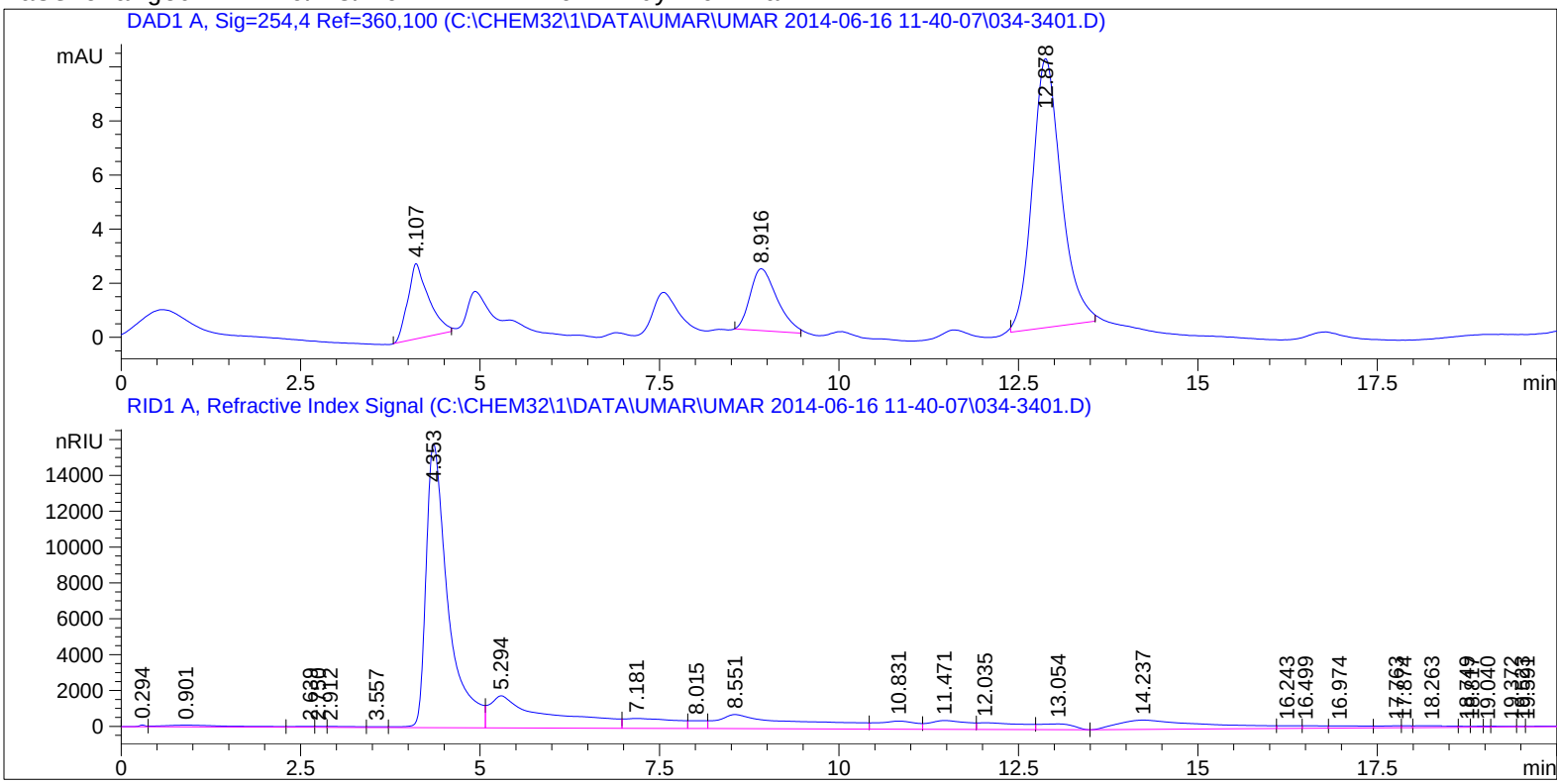
Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.287	BV	0.0924	564.57947	90.27106	0.0686
2	0.824	VV	0.5835	3420.19727	70.20397	0.4155
3	1.948	VV	0.1859	123.65213	8.14003	0.0150
4	2.340	VV	0.0655	9.09927	1.86763	1.105e-3
5	2.466	VV	0.0981	24.01879	3.29293	2.918e-3
6	2.675	VV	0.1658	82.60258	6.13213	0.0100
7	2.837	VV	0.0891	36.39397	5.73609	4.421e-3
8	3.035	VV	0.2104	100.82114	5.89369	0.0122
9	3.445	VV	0.0808	17.06292	2.75793	2.073e-3
10	4.365	VV	0.3317	4.18478e5	1.85925e4	50.8389
11	5.283	VV	0.6007	1.15654e5	2497.86499	14.0503
12	6.398	VV	0.6188	4.75691e4	990.21460	5.7789
13	7.450	VV	0.6226	3.34353e4	683.41736	4.0619
14	8.501	VV	0.8006	4.27941e4	690.73529	5.1988
15	9.869	VV	0.5752	3.70042e4	856.71313	4.4955
16	10.834	VV	0.4480	1.39659e4	445.29456	1.6966
17	11.493	VV	0.8577	3.63066e4	538.58167	4.4107
18	13.135	VV	0.4293	1.03543e4	352.30786	1.2579
19	14.228	VV	0.9251	3.13839e4	449.28192	3.8127
20	15.544	VV	0.3511	5219.66406	176.71463	0.6341
21	16.092	VV	0.7269	8973.74316	146.64783	1.0902
22	17.334	VV	0.2849	2601.23584	108.98238	0.3160
23	17.716	VV	0.2509	2042.49268	102.00291	0.2481
24	18.202	VV	0.2878	2287.73755	97.12758	0.2779
25	18.673	VV	0.3531	3146.98853	107.93611	0.3823
26	19.246	VV	0.2869	2803.73999	116.63630	0.3406
27	19.526	VV	0.4061	4236.10498	125.03644	0.5146
28	19.926	VV	0.0618	510.16177	107.54057	0.0620
Totals :				8.23146e5	2.73799e4	

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\034-3401.D
Sample Name: D3-8

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  34
Acq. Instrument : Instrument 1                   Location : Vial 34
Injection Date  : 6/16/2014 11:59:42 PM               Inj :   1
                                                Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.107 BB    0.2702   56.39168    2.78546  14.3246
   2   8.916 BB    0.3835   59.42526    2.28455  15.0952
   3  12.878 BB    0.4239  277.85318    9.94772  70.5802

Totals :                   393.67012   15.01773
```

Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.294	BV	0.0981	627.66290	93.07758	0.0928
2	0.901	VV	0.8203	6561.92041	94.82691	0.9705
3	2.639	VV	0.2597	1013.04132	47.90111	0.1498
4	2.750	VV	0.1306	504.88782	49.17817	0.0747
5	2.912	VV	0.3534	1472.63037	49.52535	0.2178
6	3.557	VV	0.2293	779.10492	43.77015	0.1152
7	4.353	VV	0.3145	3.36065e5	1.58398e4	49.7014
8	5.294	VV	0.7170	1.02129e5	1791.44067	15.1042
9	7.181	VV	0.6219	2.74114e4	552.57526	4.0539
10	8.015	VV	0.2134	7313.58057	439.84985	1.0816
11	8.551	VV	1.0044	6.28927e4	786.32935	9.3014
12	10.831	VV	0.5202	1.71395e4	449.78070	2.5348
13	11.471	VV	0.5237	1.85910e4	491.17264	2.7495
14	12.035	VV	0.5354	1.62651e4	372.43646	2.4055
15	13.054	VV	0.4687	1.04433e4	320.54199	1.5445
16	14.237	VV	1.1206	4.44621e4	520.05286	6.5756
17	16.243	VV	0.2519	3182.00610	151.27205	0.4706
18	16.499	VV	0.2542	2953.92285	140.31590	0.4369
19	16.974	VV	0.4217	4291.25537	123.78484	0.6346
20	17.763	VV	0.2710	2407.03516	107.02669	0.3560
21	17.874	VV	0.1219	963.97900	103.24192	0.1426
22	18.263	VV	0.4304	3481.73560	95.82378	0.5149
23	18.749	VV	0.1284	810.64624	80.38735	0.1199
24	18.817	VV	0.1394	805.43268	78.35254	0.1191
25	19.040	VV	0.0906	429.97061	68.41750	0.0636
26	19.372	VV	0.2601	1444.85571	66.45129	0.2137
27	19.523	VV	0.0924	463.95776	63.02494	0.0686
28	19.591	VBA	0.3433	1260.31213	61.18637	0.1864

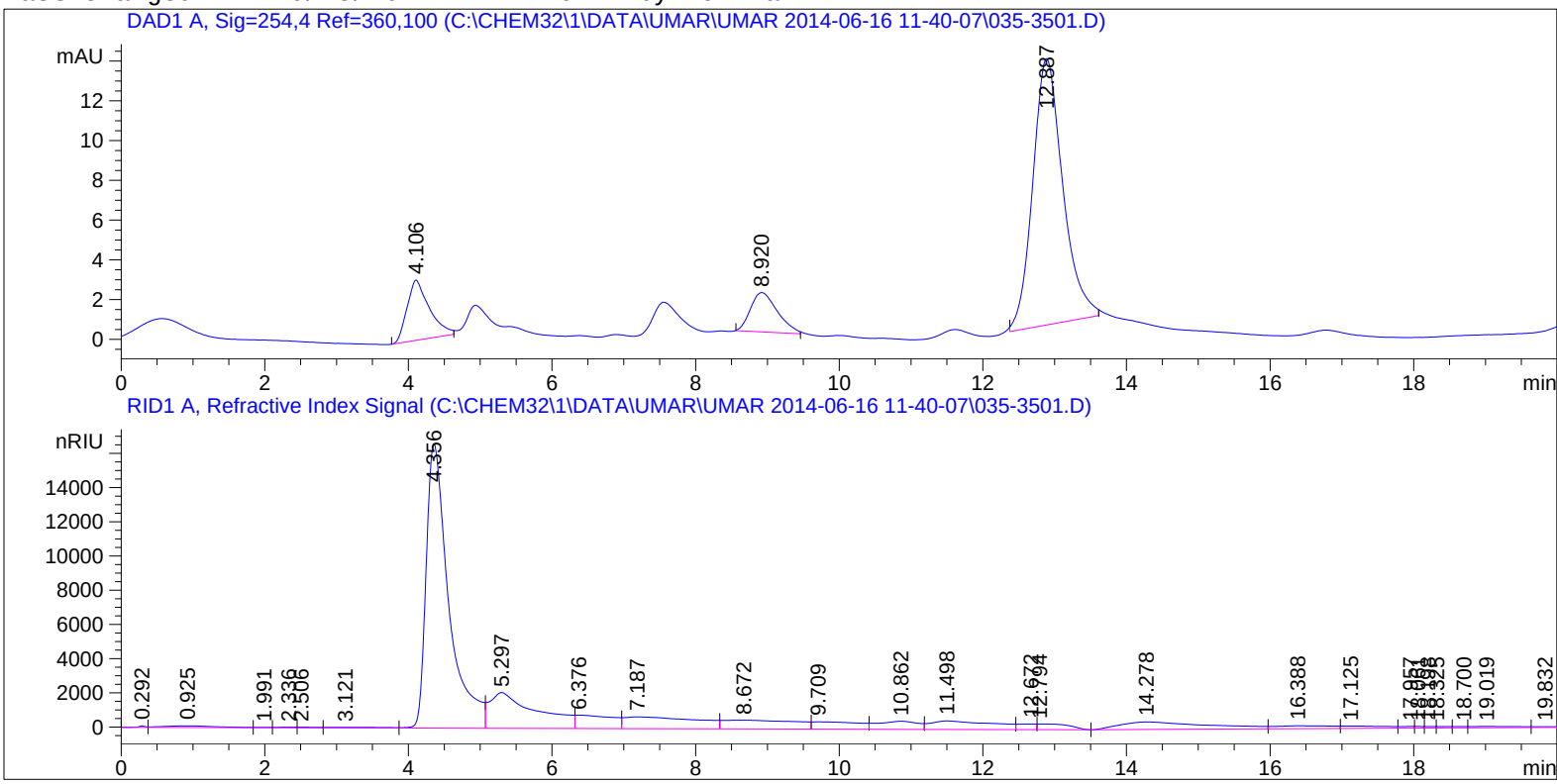
Totals : 6.76167e5 2.30816e4

==========

*** End of Report ***

Data File C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\035-3501.D
Sample Name: D3-9

```
==========================================================================
Acq. Operator   : umar                          Seq. Line :  35
Acq. Instrument : Instrument 1                   Location : Vial 35
Injection Date  : 6/17/2014 12:22:03 AM               Inj :   1
                                               Inj Volume : 10 µl
Acq. Method     : C:\CHEM32\1\DATA\UMAR\UMAR 2014-06-16 11-40-07\UMAR.M
Last changed    : 6/16/2014 11:41:31 AM by umar
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\ELFIRA FLUSH.M
Last changed    : 6/13/2014 12:41:20 PM by munira
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.106 BB    0.2911   65.25763    3.03199  12.8993
   2   8.920 BB    0.3803   51.55947    1.97706  10.1916
   3  12.887 BB    0.4368  389.08273   13.39894  76.9090

Totals :                   505.89983   18.40800
```

Signal 2: RID1 A, Refractive Index Signal

Peak #	RetTime [min]	Type	Width [min]	Area [nRIU*s]	Height [nRIU]	Area %
1	0.292	BV	0.0928	537.14899	85.37668	0.0742
2	0.925	VV	0.6174	4946.20557	94.79563	0.6829
3	1.991	VV	0.1803	353.26257	23.42271	0.0488
4	2.336	VV	0.2391	584.94879	29.88578	0.0808
5	2.506	VV	0.2433	640.81543	31.85883	0.0885
6	3.121	VV	0.6779	1924.56470	33.65871	0.2657
7	4.356	VV	0.3263	3.63201e5	1.66185e4	50.1475
8	5.297	VV	0.5786	9.43991e4	2090.60498	13.0338
9	6.376	VV	0.4497	2.76834e4	782.01440	3.8223
10	7.187	VV	0.8719	4.86277e4	690.01038	6.7141
11	8.672	VV	0.8423	3.60149e4	505.32501	4.9726
12	9.709	VV	0.5462	1.89170e4	422.44797	2.6119
13	10.862	VV	0.5294	1.83680e4	472.24957	2.5361
14	11.498	VV	0.7894	3.01843e4	497.85263	4.1676
15	12.672	VV	0.2131	5750.85352	331.71844	0.7940
16	12.794	VV	0.3635	1.00956e4	331.86560	1.3939
17	14.278	VV	1.0577	3.76369e4	440.30145	5.1966
18	16.388	VV	0.6633	9276.43457	170.37111	1.2808
19	17.125	VV	0.4921	5826.55518	139.98006	0.8045
20	17.957	VV	0.1722	1331.44507	96.23385	0.1838
21	18.061	VV	0.1009	761.31427	94.07900	0.1051
22	18.198	VV	0.1251	873.19788	89.11132	0.1206
23	18.325	VV	0.2117	1081.42053	85.13332	0.1493
24	18.700	VV	0.1571	977.67511	75.70940	0.1350
25	19.019	VV	0.5391	3382.36035	73.79147	0.4670
26	19.832	VBA	0.2524	889.27521	44.12795	0.1228
Totals :				7.24266e5	2.43505e4	

*** End of Report ***