

Direct Thermal Desorption (DTD) Extraction for Different Qualities of Agarwood Incense Analysis

Nurlaila Ismail, Mohd Hezri Fazalul Rahiman, Mohd Nasir Taib
Faculty of Electrical Engineering
UiTM Shah Alam, Selangor, Malaysia
nrk_my@yahoo.com, hezrif@ieee.org, dr.nasir@ieee.org

Mastura Ibrahim, Seema Zareen, Saiful Nizam Tajuddin
Faculty of Industry Sciences and Technology,
University Malaysia Pahang, Malaysia
saifulnizam@ump.edu.my

Abstract—Agarwood is well known as one of expensive and valuable woods due to its high demand in the market. As part of ongoing research in establishing agarwood oil quality grading, this paper presents Direct Thermal Desorption (DTD) in extracting commercial, high and low quality of agarwood incense. The Gas Chromatography – Flame Ionization Detection (GC-FID) and Gas Chromatography – Mass Spectroscopy (GC-MS) then are followed to analyze the compounds. All the identified compounds are tabulated and plotted. The result showed that high quality sample yielded the highest number of compounds, 35, followed by commercial, 32 and low quality sample, 9. It revealed that the highest relative peak areas (%) for compounds in three types of sample are different to each other. They are 8.98% (γ -gurjunene) in high quality, 11.95% (agarospirol) in low quality and 17.97% (hexadecanol) in commercial. Nine compounds, α -guaiene, β -selinene, agarospirol, guaia-1(10),11-dien-15-al, pentadecanoic acid, hexadecanol, eudesmol, guaia-1(10),11-dien-15,2-olide and 2-(2-phenylethyl) chromone exist in all samples but varied in their relative peak area (%). The finding using proposed method, DTD is significant, hence it will benefit further analysis especially for agarwood grading.

Keywords—Direct Thermal Desorption, agarwood, quality, GC-MS and GC-FID

I. INTRODUCTION

Agarwood or gaharu is called as ‘chenxiang’ in Chinese [1]. This resinous heartwood is popular and has high demand in market due to its unique scent [2]. Agarwood as well as its essential oil has been used in many applications such as in perfumery industry, religious ceremony and traditional medicine. Not limited to that, agarwood is a symbol of wealth in the Middle East countries and its incense is burnt during wedding ceremony [2].

Extracting and analysing chemical properties in agarwood is an omnipresent study [3]. Agarwood is reported to have different compounds and that make them differ to each other in term of quality. The highly priced wood is a mixture of monoterpenes, sesquiterpenes and its chromone derivatives [4, 5]. Researchers highlighted sesquiterpenes as a major compounds in agarwood especially for high quality [6, 7].

Currently, agarwood is graded based on its physical properties such as colour and odour [3]. Dark colour and occupied with strong and long lasting odour is synonym to the high quality. This grade normally is traded at a premium

price. It can reach until USD 30 000 per kg [3]. Traditional method in grading agarwood to different qualities has disadvantages such as the result is not consistent as it is from human experiences and varies to each person. Human nose also cannot tolerate with many samples at the same time [8]. Therefore, there is a requirement for agarwood is graded or classified accordingly to its chemical profiles. The result will be more accurate and consistent compared to the traditional method [9]. Thus, the objective of the paper is to propose Direct Thermal Desorption (DTD) in extracting agarwood incense compounds from commercial, low and high quality. Generally, the works in this paper will be involved of, i) extract the agarwood incense (high, low and commercial) by using DTD, ii) the compounds identification will be done using GC-FID and GC-MS, and iii) the trend for every type of agarwood will be plotted and examined.

The remained of the paper is organized as follows: Section II is Data Extraction and Analysis where general information on DTD, GC-FID and GC-MS were mentioned, Section III is Experimental, consists of sample preparation and set-up for DTD, GC-MS and GC-FID procedure. After that is Section IV, Result and Discussion, before Conclusion is made in Section V.

II DATA EXTRACTION & ANALYSIS

Direct Thermal Desorption (DTD) is exceptionally alternative technique for analyzing solid, liquid and slurry sample in a very small quantity. With this technology, Agilent Technologies from U.S.A bring a tool, a Thermal Separation Probe (TSP) developed by Aviv Amirav and Shai Dagan in Fig. 1 [10]. For this technique, no sample preparation is needed and risk of sample contamination can be avoided. These conditions make this method fast and easy. This process is controlled by temperature and fine tune split ratio. The result is obtained faster due to a skipping preparation process. Only a few granules of solid sample or at least 1 μ L of liquid sample are required and put into a micro-vial prior to insert at GC injector. This process makes the system clean as a result of non-volatile high boiling point compounds or dirty sample matrix still remain in the vial once the sample vaporized.