CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Bauxite is a naturally occurring, heterogeneous weathering product composed primarily of one or more aluminium hydroxide minerals, plus various mixture of silica ($Si_2$), iron oxide ($Fe_2O_3$), Titania ($Ti_2$) and other impurities in minor or trace amounts (Shaffer and Patterson et al, 1983). (Hyslop, 2012) classified the end of product of the process is a slurry of aluminate ions which separated by filtration from the mixture of basic iron and silicon oxides, commonly knows as ‘red mud’. Overflow of toxic “red mud” created serious pollution to nearby Pengorak river and beach. Bauxite mining damages forests, pollutes waterways, and encroaches on agriculture land often displacing small farmers (Mimi Sheller, 2014).

Due to the advent of increasing human populations, the range requirements for water has increased with higher demands for higher water quality. Water pollution due to the deforestation and destruction of watersheds due to industrial and residential development have aggravated the problem soil erosion and river siltation (Akhtar, 2002). The source of most of these contaminants is sewage from human habitations and industries, although this is not exclusive and there are other sources. The water sources most likely to be affected are surface waters by sewage effluent and diffuse agriculture inputs (Tortajada, 2013). The effect of pollution does not remain at the place where it is polluted but travels several kilo meters radius from the point of discharge (Amankwah Emmanuel, 2013). From bauxite mining, aluminium toxicity in soils is particularly harmful because it causes shallow rooting, drought susceptibility, and deficient nutrients input (Kabata-Pendias and Mukherjee, 2014).
The use of conventional treatment like alum based coagulant will inevitably increase the concentrations of aluminium in the water, hence would not be advisable. An alternatives approach using non-aluminium, non-chemical based coagulant could minimise this effect. In this study, Pengorak river contaminated raw water was collected and treated with polysaccharide based biocoagulant. As a treatment, linear polysaccharide biocoagulant are one of the coagulant to treat the pollution water. Linear Polysaccharide or knows as Chitosan (N-acetyl-D-glucosamine) is a cationic biodegradable biopolymer produced by the extensive deacetylation of chitin obtained from shrimp shell wastes (Ahmad and Sumathi, et al Hameed, 2006). Linear Polysaccharide Biocoagulant has been recommended as a suitable coagulant resources material because of its excellent properties such as biodegradability, biocompatibility, adsorption properly, flocculating ability, polyelectrolisity and its possibilities of regeneration in number of applications (Ahmad and et al Hameed, 2006).

1.2 PROBLEM STATEMENT

Water quality of rivers, stream and lakes are one of the most common issues in Malaysia. Government, private company and publics are aware about the future rivers conditions.

Water quality river of Sungai Pengorak, Kuantan, Pahang has contaminated by the bauxite activities and has been chosen for the study of the quality because of its importance and functions to the societies. They used this river as water sources due to rapid development and urbanization process around the area. Kuantan’s residents are at risk of metal poisoning from bauxite mining in the state. Toxic run-off from bauxite mines and processing plants are seeping into rivers that provide the main water supply. Digging at bauxite sites causes irreparable damage to topsoil and the environment. When red sludge from the mining process is dumped on the ground, toxic chemicals seep into the underground water table when it rains, which
in turn contaminates main water sources. The effects of red sludge can be clearly polluted during rainy season especially on monsoon seasons.

Therefore, it is important to study the level of pollution in the river and determine the causes of pollution in order to recommend suitable solutions for this problem. Besides, the polluted river will influence the look, colour and the smell of the river. Clean water supply is needed to protect health of consumer and preserving the environment of the ecosystem of river.

1.3 OBJECTIVE

The objective of this study are as following:

1) To determine the water quality parameters of Sungai Pengorak, Kuantan based on Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD5), Chemical Oxygen Demand (COD), Total Suspended Solids (SS), Ammonia Nitrogen (AN), Total Dissolve Solid (TDS), Turbidity and pH.

2) To classify the quality of Sungai Pengorak, Kuantan based on Water Quality Index (WQI), Interim National Water Quality Index (INWQS) and National Drinking Water Quality Index (NDWQS).

3) To determine the optimal dosage and effectiveness of Linear Polysaccharide Biocoagulant needed for contaminated bauxite water treatment.