EFFECTS OF CHEMICAL AND PHYSICAL PRE-TREATMENT OF NATURAL ZEOLITE CATALYST FROM POTTERY WASTE

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ABSTRACT

Natural zeolite catalyst from pottery waste would give some added value to pottery industries such as a proper waste management and a cheaper alternative to existing commercialized catalyst. The purpose of this work is to study catalytic properties of pottery waste via physical and chemical treatments and to characterize the catalytic properties of treated pottery waste. Sungai Sayong pottery waste was turned into powder by crushing, grinding and sieving. Then, it was pre-treated by physical and chemical means of hot water, autoclave, 1M of HCl, 1M Acetic Acid, Hexane and Propanol. Treated and untreated samples were characterized by using Thermogravimetric Analysis (TGA), X-ray Diffractometer (XRD), BET method, CHNS Elemental Analyzer and Fourier-Transform Infrared Spectrometer (FTIR). The results obtained shows that (TGA) each sample have the similar trend of weight loss and temperature stability with the commercialized zeolite. By using elemental analyzer, the amount of organic content for each sample can be seen whereby weak acid sample has the highest content of carbon of 53.8908% while the next highest sample only contains 5.6220% carbon From the analysis of XRD, when being cross-referenced with components of Kaolin which are Si, Al, Mg, Fe, Ti, O2 showed positive presence of each elements and resembles XRD data of ZSM-5 but with a little lower intensity. BET surface area shows that sample 4,5 and 7 has a positive increment from the pre-treatment done as their surface area increases to 30.4137 m2/g, 29.2670 m2/g and 20.6381 m2/g compared to sample 1 (untreated sample) which is 19.0779 m2/g. FTIR was done to see presence of functional groups which are Al and Si derivatives mostly according to Kaolinite Clay and also ZSM-5. As conclusion, zeolite derived from Sungai Sayong pottery waste has similarity with the commercialized zeolite in term of weight loss, elemental content and functional groups. Strong acid pre-treatment showcased the best results when being characterized compared to the other pre-treatments.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

There is a clear correlation between growing number of humans living on earth with other species being swiftly shrinking in population, and the increase in damages of mother nature as well. The existence of human species has put a big pressure on the world's ecosystem, sending some animal species straight to either threatened population or extinction, cutting trees, destroying forests and creating abundance and uncontrollable amount of wastes (Murray, Patridge, & Bonneville, 2010). One of the reasons towards a lot of destruction towards mother nature involves development which does not take into account of sustainability of the environment which is wrong and should be prevented. Awareness to take care of the environment has increased with a lot of environmental movements, including in Malaysia such as '*Tak Nak Straw'*, '*Zero Waste Malaysia'*, '*Sampah Menyampah*' and many more, which has similar aims of reducing waste, reducing pollution and educating people about the impacts of human actions towards the environment. Massive urbanization has created an abundance of waste which are uncontrollable and causing adverse effects to human health and environment quality. One major impact from the enormous production of waste is "pollution". According to Oxford English Dictionary, Pollution can be described as the presence in or introduction into the environment of a substance which is harmful or poisonous.

Clay is one of the produced wastes available all over the world as it is one of the important materials to manufacture high quality porcelains, potteries, crafts and many more. There are three well known pottery types in Malaysia which are Mambong from Kelantan, Labu Sayong from Perak and Kudin from Sarawak. 'Labu Sayong' famous in Kuala Kangsar, Perak is a type of pottery or earthenware using natural clay commonly from river.