RAPID PREPARATION OF EXPANDABLE GRAPHITE BY USING ULTRASONIC IRRADIATION TECHNIQUE

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ABSTRACT

Expandable graphite was prepared by using ultrasonic irradiation technique without causing damage to the graphite itself after being modified. From this preparation of expandable graphite, the mechanism of intercalation and exfoliation was studied to determine how graphite was synthesized from flake to expandable graphite. A mixture of flake graphite and ultrasonic solvent was prepared and undergo sonication inside an ultrasonic bath. In this work XX types of solvents were used. The maximum ultrasonic time was kept for 4 hours. The expansion of the graphite was observed and the volume of expandable graphite was obtained during washing process. The expandable graphite was then dried inside the oven at the temperature of 60°C. X-ray diffraction analysis was then used to determine the crystallographic structure of expandable graphite. Besides that, Fourier Transform Infrared was also used to determine the existence of any functional group in expandable graphite prepared. Scanning Electron Microscope was also used to determine the characterization of expandable graphite synthesized. It was found that, nitric acid was the best solvent to be used as intercallant with 3 hours sonication time and high ultrasonic power. The crystalline structure of graphite was observed to remain the same after being expanded using ultrasonic method. Therefore, it is considered as an excellent graphite modification method in producing huge amount of high quality graphene instead of using original flake graphite.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Graphite is one of the polymers of carbon which is formed naturally. Graphite is usually be compared with diamonds as these two materials are the only polymers of carbon which occur on their own. One of the most unique characteristics of graphite is its structure that consists of layers. It is a two dimensional crystalline structure where atoms are arranged inside the layers. The in-plane carbon atoms are bonded by strong covalent bonds while graphite layers are bounded by weak Van der Waals forces. Due to the unique structure of the graphite, it is enabled to be modified and improvised into different form of graphite such as synthetic graphite, expanded graphite and many others. (Sever et al., 2013)

The layers of graphite are held by weak bonds between each other which makes graphite as a smooth and greasy materials. Because of these characteristics, it makes graphite as a good solid lubricant. Graphite is also a very strong material which can resist changes physically and chemically. Due to this reason, graphite is considered as an excellent heat and electric conductors. Graphite is one of the most important materials in steel industry, automotive industry, electrical appliances as well as crucible production. (The, 2011)