Synthesis and Characterization of Graphene Oxide Material Made from Carbon Wastes of ZnC Batteries using X-Ray Radiation in order to Re-use Hazardous Wastes to Become Advanced Material Based on Simple and Eco-Friendly Method

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ABSTRACT

This study aims to determine the effect of X-ray irradiation towards the characterics of GO material produced by exfoliation of graphite material from the carbon rod of ZnC battery wastes using a combination of liquid exfoliation (LE) method and X-ray radiation assisted by commercial detergent. This study begins with making a solution consisting of graphite and detergent, i.e.: aquades, carbon powder of ZnC battery wastes, and commercial detergent. In the LE method, the mixing of the solution is carried out using a blender for two minutes. The solution is then exposed to X-ray irradiation with varying radiation time of 0 hour (no radiation), 1 hour, 2 hours, and 3 hours. From this study, it is expected that re-using hazardous ZnC battery wastes produce GO material via a simple and eco-friendly method, i.e.: X-ray irradiation. The UV-Vis results show that GO is produced for the sample without X-ray irradiation due to the exfoliation of the graphene layers by the surfactants in the commercial detergent. The UV-Vis results of the samples afer X-ray irradiaton treatment show a decrease in absorbance value at a peak of 270 nm, particularly for two and three hours of X-ray irradiation. This indicates an early forming of reduced-GO (rGO). The surface morphology results of the samples using SEM show the presence of bulky materials in the sample without X-ray radiation and smaller square-shaped materials after the samples have been subjected to X-ray irradiation. There is a twice size reduction of the material before and after being exposed by X-ray irradiation. The FTIR results indicate the presence of functional groups reffering to almost the same GO material for all time variations of X-ray irradiation. Furthemore, X-ray irradiation may reduce the OH functional group in the GO material, but not enough to fully reduce the GO into rGO.

Kata Kunci: *GO, LE method, X-ray irradiation, detergent*