

EFFECT OF ALKYLAMINE FUNCTIONALIZATION ON THE PROPERTIES OF GRAPHENE OXIDE

Ibrahim, N.A.^{1*}, Ahmad Daud, N., Chieng, B.W

*Department of Chemistry, Faculty of Science,
Universiti Putra Malaysia,
43400 UPM Serdang, Selangor, Malaysia*

**Corresponding author: norazowa@upm.edu.my*

The introduction of hydrophobic groups on graphene oxide, GO surface is an attractive objective when aiming for compatibility with non-polar substances and making of coating materials. In this work, GO was used as the main materials for modification in order to improve the hydrophobicity. Gamma-ray (γ -ray) irradiation technique was used to functionalize graphene oxide (GO) with various alkyl chain length of an alkylamine. Functionalization of alkyl chain onto the GO was confirmed by X-ray Diffraction (XRD), Fourier Transform Infrared (FTIR), Nuclear Magnetic Resonance (^1H NMR), and X-ray Photoelectron Spectroscopy (XPS). XRD analysis showed the diffraction peak of graphite was shifted from $2\theta=26.40^\circ$ to lower angle at $2\theta=10.20^\circ$ corresponding to an increasing the interlayer spacing from 0.34 nm of graphite to 0.87 nm of GO upon oxidation. Further increasing of interlayer up to 2.68 nm for GO-A18 was observed after functionalization suggested the long alkyl chain was successful intercalated between graphene sheets. FTIR spectra verified the existence of oxygen functionalities on GO after been oxidized by modified Hummers method. Functionalization by γ -ray irradiation method was able to attach alkyl chain on the surfaces of GO by the appearance of significant peaks around $2928\text{--}2863\text{ cm}^{-1}$ corresponding to the C-H stretching vibration of the alkyl chain (CH_2). The removal of oxygen functionalities was confirmed by decreasing of O/C ratio in XPS analysis. The effects of various alkyl lengths functionalized-GO on morphological and thermal properties were also investigated. The addition of alkyl chain on GO surfaces significantly improves the thermal stability of GO, suggesting their great potential for hydrophobic material in for various applications. Scanning Electron Microscopy (SEM) micrographs showed an increase in surface roughness after functionalization. The contact angle increased with the increase of the alkyl chain (GO-A12, 91.12° while GO-A18, 114.11°). The successful attachment of alkylamine chain on GO sheets offers a great idea for hydrophobic materials preparation.