SYNTHESIS, CHARACTERISATION AND EVALUATION OF HYDROPHOBIC LIGNOCELLULOSES-CLAY NANOCOMPOSITES FOR ORGANIC POLLUTANT REMOVAL FROM WATER

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ABSTRACT

Introduction

Organic pollutants in water raise great concerns mostly due to the carcinogenic effects of some of these compounds [1]. Water treatment methods and materials therefore need to be developed and modified for optimum removal of organics. Adsorption technology is proving to be a cost effective water treatment method with great potential for removal of organic pollutants from water [2]. The PMPSgLig-NaMMT nanocomposite has proven to be a successful adsorbent for both organic and inorganic pollutants from water, but its optimization for organic pollutant removal has shown to be conditionally limited to polar organics in the presence of metal cations [2]. This study is aimed at modifying PMPSgLig-NaMMT nanocomposite for enhanced organic pollutant removal from water through adsorption.

Methods and Results

1. PMPSgLig-NaMMT nanocomposite synthesis:

The PMPSgLig-NaMMT nanocomposite was synthesized by coupling of powder leaf biomass and NaMMT nanoclay using methacryloxypropyl trimethoxysilane (MPS).

2. PMPSgLig-NaMMT nanocomposite functionalization:

The PMPSgLig-NaMMT nanocomposite was modified in two ways namely, esterification and etherification, and characterized using FT-IR and XRD.

a) Esterification was achieved using butyric acid in the presence of acetic anhydride under acid catalysis.
b) Etherification was achieved using 1-chlorobutane and 1-bromo-3-phenylpropane in two separate samples Ag_2O catalyst (Williamson's ether synthesis). Etherification functionalization was also achieved by treatment of the raw composite with butan-1-ol using acid catalysis.

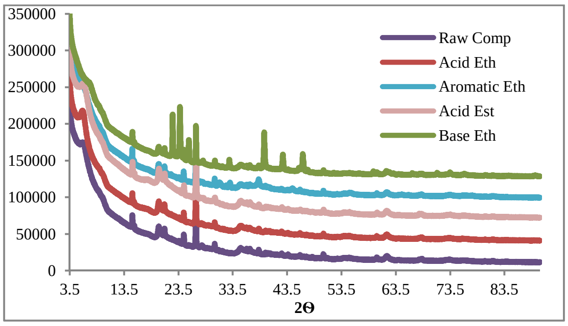

Fig. 1: XRD spectra of nanocomposites.

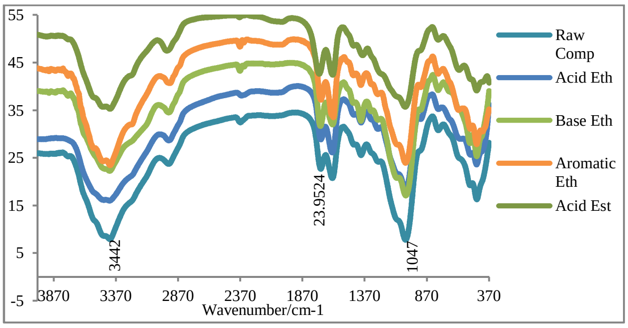

Fig. 2:FT-IR spectra of nanocomposites.

Discussion and Conclusion

Composite material was successfully synthesized and functionalized with minimal to no degradation of the original material. Materials are nanocomposites and the pH of the functionalization environment may have an effect on the physical nature (intercalated or exfoliated) of the product material.

References

[1] D. W. Connell, G. J. Miller and S. M. Anderson, *Persistent Organic Pollutants*, (2007), Chapter 17.
[2]T. Bunhu, L. Tichagwa, *Functional polymeric material and composites* (Macromol Sym, 2012), 313-314, 146–156.