Synthesis of Organic Ni/Al Layered Double Hydroxide (LDH) Nanostructures

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Layered double hydroxides (LDHs) constitute a family of layered materials which are also known as hydrotalcite-like compounds [1].They represent a class of layered materials with chemical composition $[M^{II}_{1-x}M^{III}_x(OH)_2]_x+[A^{n-}_{x/n}.\ yH_2O]^{x-}$; where M^{II} and M^{III} are divalent and trivalent metal cations, respectively; A^{n-} is an n-valent anion and x has values between 0.20 and 0.33 [2]. LDHs have found a wide range of applications as base catalysts, and polymer additives etc. Intercalation of organic anions is an important aspect of layered double hydroxide (LDH) chemistry in the development of polymer–LDH composites. However, the generally hydrophobic nature of the polymers makes LDH dispersion more difficult, and this is among the motives for preparing hydrophobicized organo-LDH [3]. Organo-LDHs can be prepared by various methods that the most common simple method applied for their preparation is co-precipitation. In this research, the organo-modified Ni/Al-LDH (O-Ni/Al-LDH) was prepared by the co-precipitation method at a constant pH. The structural of the product were determined by X-ray powder diffractometry (XRD), Fourier transform infrared spectroscopy (FT-IR), and scanning electron microscopy (SEM).

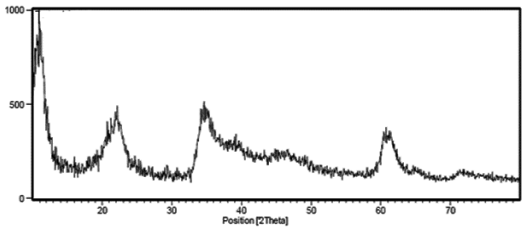

Figure *1: XRD pattern of organo-Ni/Al- LDH*

The XRD pattern of organo-Ni/Al-LDH as shown in Fig. 1 shows that the sample has a good crystal hydrotalcite-like structure with the rhombohedral system (JCPDS 22-700).

Observation from SEM image presented in Fig. 2 shows that the morphological nanostructure of organo-Ni/Al LDH has layered.

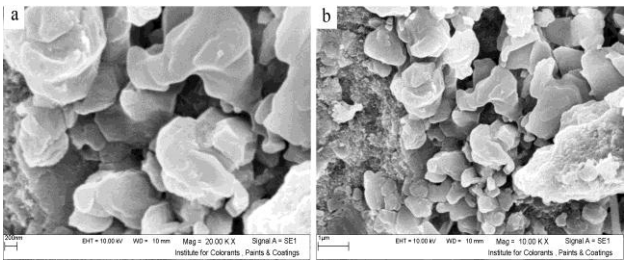

Figure 2: SEM images of sample ofOrgano- Ni/Al-LDH nanostructures

Fig. 3 shows the FT-IR spectra of O-Ni/Al LDH. A broad absorption peak at 3490Cm^{-1} attributed to the O–H stretching vibration and the peak at 1382 cm^{-1} assigned to anionic structures in LDH galleries (Nitrate groups). Peaks at 1384, 2924 and 2855 cm^{-1} are attributed to CH_3 group on the aromatic ring and C=C-H aromatic ring, respectively. For TS-LDH, the symmetric and asymmetric stretching vibration of S=O appeared at 1040 cm^{-1} and 1190 cm^{-1}, respectively.

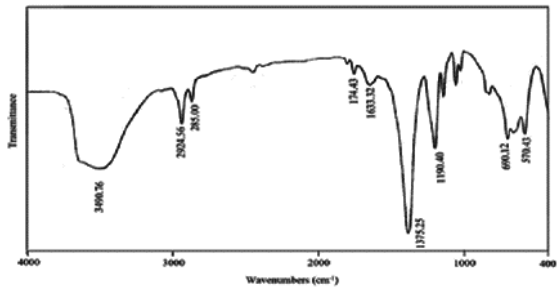

Figure 3: FTIR spectra of sample of organo- Ni/Al-LDH nanostructures

References

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