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 or anionic clays [1].They represent a class of layered materials with chemical composition expressed by the general formula $[M^{II}_{1-x}M^{III}_{x}(OH)_2]_x+[A^{n-}_{x/n}.\ yH_2O]^{x-}$ where M^{II} and M^{III} are divalent and trivalent metal cations, respectively; A^{n-} is an n-valent anion and x has usually values between 0.20 and 0.33 [2]. 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. Layered double hydroxides (LDHs), have attracted more and more attentions owing to potential applications as anion exchangers, adsorbents, medicine stabilizers, catalysts, environmental protection, pharmaceutical applications, solid-state nanoreactors and molecular sieves, polymer composites, and bioactive materials.

The structural of the product were determined by X-ray powder diffractometry (XRD), Fourier transform infrared spectroscopy (FT-IR), and scanning electron microscopy (SEM).

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. Fig. 3 shows the FT-IR spectra of O-Ni/Al LDH. Two indicator peaks can be seen in this sample; 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). In this figure, 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 stretchingvibration of S=O appeared at 1040 cm^{-1} and 1190 cm^{-1}, respectively.

References

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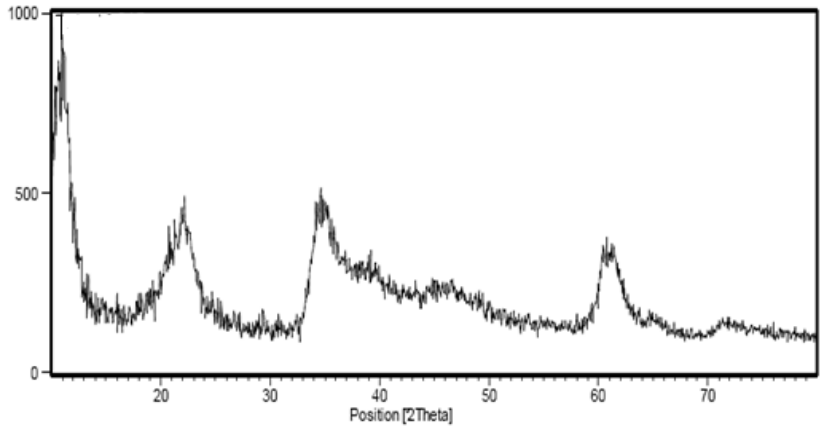

Figure *1:XRD pattern of organo-Ni/Al- LDH*

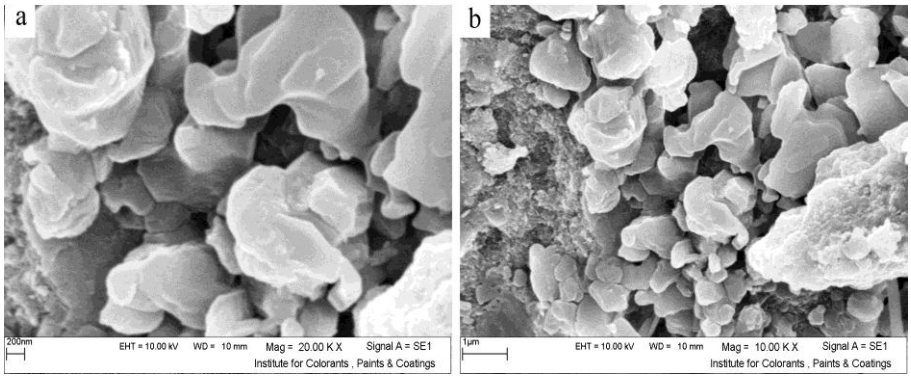

Figure 2: SEM images of sample ofOrgano- Ni/Al-LDH nanostructures

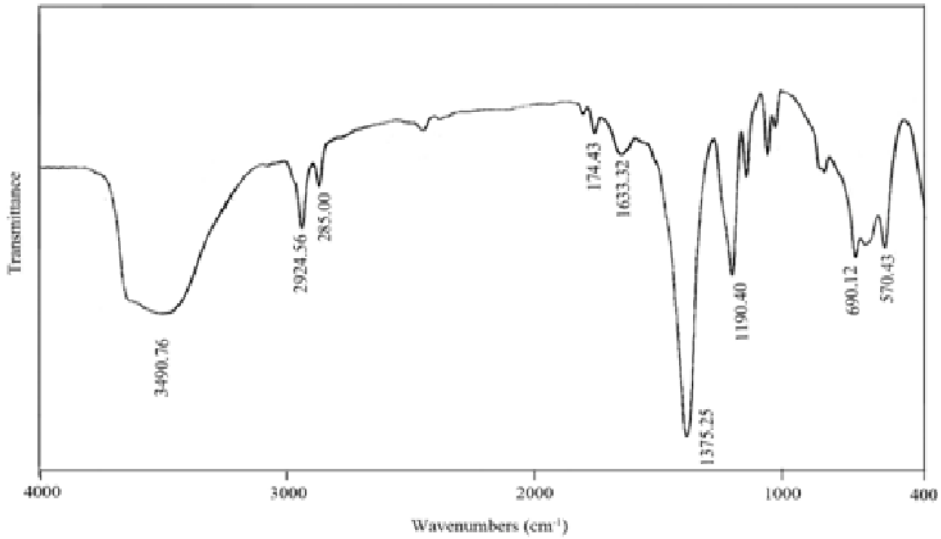

Figure 3: FTIR spectra of sample of organo- Ni/Al-LDH nanostructures