

Synthesis of Zinc-Aluminium-Pamoate Nanocomposite using Direct Co-Precipitation and Ion-Exchange Methods

ABSTRACT

The intercalation of pamoate anions into the interlamellae of zinc-aluminium layered double hydroxide (LDH) was carried out by two different methods; direct co-precipitation and ion-exchange methods. The Zn/Al molar ratio, R of the LDH was set at 2 - 5 ($x = 0.33 - 0.16$, where $x = [Al^{3+}]/([Zn^{2+}] + [Al^{3+}])$) and the concentration of pamoate ion used was fixed at 0.02 M. A sharp, intense and symmetrical peak could be observed from the XRD patterns for all the samples synthesized by direct co-precipitation method, indicating a well-ordered nanolayered structure in the nanocomposite. However, the XRD patterns of the nanocomposite prepared by ion-exchange method show that the second peak for (006) reflection are broad and not symmetrical due to the overlapping of two peaks at $2\theta = 10^\circ$, which indicated the presence of LDH with nitrates as the counter anion. The percentage of PA intercalated into the interlamellae of the nanocomposite prepared by ion-exchange method is in the range of (29 - 45)%, which is lower than the one prepared by direct co-precipitation method, (43 - 51)%. This shows that direct co-precipitation method yielded nanocomposites with higher loading of the organic moiety and better crystallinity compared to the ion-exchange method.

Keyword: Organic-inorganic hybrid, pamoic acid, layered double hydroxide, nanocomposite