

Ordered layered organic-inorganic of 4-chlorophenoxyacetate-zinc layered hydroxide nanohybrid

ABSTRACT

Ordered layered organic-inorganic nanostructure composed of zinc layered hydroxide-4-chlorophenoxy acetate (ZLH-4CPA) was prepared by reaction of an organic anion, 4-chlorophenoxy acetate (4CPA) with ZnO under aqueous environment. The concentration of 4CPA was found to be a controlling factor in determining the formation of phase pure, well ordered nanolayered hybrid material. At lower concentration of 4CPA (0.05 M), a mixed phase was observed in which ZnO co-existed with the nanohybrid. At 0.01 M, a pure phase is obtained with high crystallinity but a well ordered nanolayered structure is lacking. A pure phase, well ordered nanolayered hybrid can be clearly observed at 0.2 M 4CPA. ZnO shows well defined grain structure of various sizes at nanometer scale range. Direct reaction between ZnO and 4CPA under aqueous environment resulted in the formation of 4CPA-ZLH nanohybrid with flake-like fibrous structure. On heating at 500° C for 5 h under atmospheric condition, the nanohybrid was transformed back to well defined grain structure, as previously observed for the starting materials, ZnO. This shows that the nanohybrid has memory effect property. Well ordered nanolayered hybrid with up to 5 harmonics, from which the average basal spacing of 19.03 Å of the material was deduced, showing long range order of the layer packing.

Keyword: 4-chlorophenoxyacetate; Memory effect property; Nanohybrid; Zinc layered hydroxide