

Layered double hydroxide as carrier of herbicide, 2-methyl-4-chlorophenoxy acetic acid : physicochemical characterization and controlled release properties

Abstract

A new organic-inorganic hybrid nanocomposite Zn-Al-MCPA layered double hydroxide was prepared by intercalation of 2-methyl-4-chlorophenoxy acetic acid (MCPA), into Zn-Al-layered double hydroxide (ZAL) at various concentration of MCPA ranging from 0.1 to 0.7. The pH of the formulation was kept constant at 7.5. Well-ordered hybrid nanocomposite was obtained with 0.4 M MCPA with an expansion of basal spacing from 8.9 Å in the ZAL s resemblance peaks of to 19.7 Å in the resulting nanocomposite. The FTIR spectra of the nanocomposite shows resemblance peaks of the MCPA and Zn-Al-layered double hydroxide indicates the inclusion of MCPA into the layered double hydroxide with loading of MCPA found to be 45% (w/w). The release of MCPA into various aqueous solution was found to be dependent on the anion in the aqueous solution, in the order of phosphate > sulphate > nitrate with the percentage release of 80%, 44% and 8%, respectively. This study shows that Zn-Al-layered double hydroxide can be used as a host carrier for herbicide, MCPA with controlled release capability.

Keyword: 2-methyl-4-chlorophenoxy acetic acid; Herbicides; Hybrid nanocomposite; Layered double hydroxide.