

Influence of metallic molar ratio on the electron spin resonance and thermal diffusivity of Zn-Al layered double hydroxide

ABSTRACT

The coprecipitation method was used to prepare Zn-Al layered double hydroxide (Zn-Al-NO₃-LDH) at pH 7.5 and different Zn²⁺/Al³⁺ molar ratios of 2, 3, 4, 5, and 6. The elemental, structural, and textural properties of prepared samples were studied. The crystallinity of prepared LDH nanostructure decreases as Zn²⁺/Al³⁺ molar ratio increases. The electron spin resonance (ESR) spectroscopy of different LDH samples showed new ESR spectra. These spectra were produced due to the presence of different phases with formed LDH such as ZnO phase and ZnAl₂O₄ spinel. At low Zn²⁺/Al³⁺ molar ratio, the ESR signals were produced from the presence of free nitrate anions in the LDH interlayer. Above Zn²⁺/Al³⁺ = 2, the ESR signals were attributed to the existence of ZnO phase and ZnAl₂O₄ spinel in the samples. Because the nuclear magnetic moment of ⁶⁷Zn is lower than ²⁷Al, the increasing in Zn²⁺/Al³⁺ molar ratio causes a reduction of the magnetic activity of ZnAl₂O₄ spinel. Thermal diffusivity versus in situ temperature showed nonlinear relation for different samples due to the changing in the water content of LDH as temperature increases. The dc conductivity of samples decreased as Zn²⁺/Al³⁺ molar ratio.

Keyword: Electron spin resonance; Layered double hydroxide; Thermal diffusivity.