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Abstract

A Chimie Douce Route to Layered Double Hydroxides †

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Recently, layered double hydroxides (LDHs) have attracted substantial attention due to their wide range of important application areas, e.g., catalysis, photochemistry, biomedical science and the environment [1,2]. LDHs can be fabricated through different synthesis methods. The most common preparation techniques are co-precipitation [3] and anion exchange [4]. The aim of this study is to show the advantages of the Chimie Douce route to LDHs. The indirect sol-gel synthesis route for the preparation of LDHs was recently developed and suggested [5]. Synthesized precursor gels were converted to mixed metal oxides (MMOs) by heating the gels at 650 °C. The LDHs were fabricated by reconstruction of MMOs in water at 80 °C. In this study, the co-precipitation and novel indirect sol-gel synthesis techniques for the preparation of Mg-Al LDHs were compared and luminescent properties have been investigated. The peculiarities of the intercalation of organic anions to the LDH structures were also studied. In conclusion, the proposed sol-gel synthesis route for LDHs shows some benefits over the co-precipitation method such as simplicity, high homogeneity and good crystallinity of the end synthesis products, effectiveness, cost efficiency and suitability for different systems. It was also demonstrated that the luminescence of lanthanide element in the $Mg_3Al_{1-x}RE_x$ could be induced by intercalation of organic reagents to the LDH structure. The Mg_3Al LDH coatings have also been successfully fabricated using the same sol-gel processing route.

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