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Effect of microwave-assistant intercalation on photoluminescence emissions and photo-stability

Zolfaghar Rezvani[a], Leila Jafari Foruzin[a] and Kamellia Nejati*[b]

[a] *Department of Chemistry, Faculty of Basic Sciences, Azarbaijan Shahid Madani University , Tabriz, Iran*

[b] *Department of Chemistry, Payame Noor University, P.O.BOX 19395-3697 Tehran, Iran*

** z_rezvani@yahoo.com*

The layered double hydroxides (LDHs) have several advantages such as unique structure, large intercalated anions within interlayer spaces, and uniform distribution of metals in the layered structure which make the LDHs significant layered materials [1]. Recently, intercalation using microwave- assistant method has received more attention [2]. The advantage of this process is decreasing the time of reaction [3]. Intercalation using microwave- assistant method can be used as a method to control the dye molecules inside the LDH layers and improve the fluorescence properties of the nanohybrid but at the photoluminescence devices, photo-stability of prepared nanohybrids is as a key point for increased efficiency of the device [4]. On the other hands, the photo-stability of azoic dyes such as mordant orange 1 is very poor under UV light. The purpose of this study was the preparation of layered double hydroxide (LDH) based nanohybrids with improved photoluminescence emission with high photo-stability. The anion exchange based microwave method was applied for the intercalation of mordant orange 1 into MgAl-LDH. In the MgAl-LDH interlayer space, a tilted orientation and bilayer arrangement were predicted for the mordant orange 1 anions. Compared with the pure mordant orange 1, the MgAl–LDH/ mordant orange 1-MA (prepared using the microwave-based anion exchange method) has improved photoluminescence emission with high photo-stability. These findings supply a new approach for designing photoluminescence materials that potentially apply to optical devices with high photo-stability

Keywords: MgAl–layered double hydroxide, Mordant orange 1, photoluminescence emission

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