

Synthesis and characterization of a new lanthanum complex and preparation of lanthanum oxide nanoparticles

Fahimeh Shafaie Najafabadi, Mohammad Taghi Behnamfar, Marzieh Daryanavard, Fatemeh Davar, Hassan Hadadzadeh*

Department of Chemistry, Isfahan University of Technology, Isfahan 84156-83111, Iran
(e-mail: hadad@cc.iut.ac.ir)

Lanthanides are an attractive class of elements and have unique optical, catalytic and magnetic properties as a consequence of their unique 4f electrons configuration. Among various lanthanum-based materials, lanthanum oxide (La₂O₃) is a great research interest due to its technological applications [1-6]. In our study, a new lanthanum methyl orange complex, [La(L)₃(DMF)₃(H₂O)₃], L = 4-[(4-dimethylamino)phenyldiazenyl]benzenesulfonate, was synthesized *via* the reaction of methyl orange with lanthanum(III) nitrate hexahydrate in the aqueous solution. Diffusion of ether into a DMF solution of the complex gave the red crystals suitable for X-ray crystallography. Then the lanthanum oxide nanoparticles were prepared by the various methods such as calcination and hydrothermal methods from the new lanthanum complex as the precursor. La₂O₃ nanoparticles were prepared by the calcinated La complex precipitate in air at different temperatures up to 950 °C for 2 h. The calcination temperature was the key parameter which was changed for more investigation. The products were characterized by X-ray crystallography, elemental analysis, X-ray diffraction (XRD), FE-SEM, luminescence, FT-IR and UV-Vis spectroscopies.



Fig. 1. The molecular structure of ([La(L)₃(DMF)₃(H₂O)₂). The hydrogen atoms are omitted for more clarity

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