Synthesis and characterization of structural and optical properties of Dysprosium stannate (Dy$_2$Sn$_2$O$_7$) nanocrystals with pyrochlore phase by hydrothermal method

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(Received: 25/11/2020, in revised form: 13/2/2021)

Abstract: In this research, the Dysprosium stannate nanostructured compound (Dy$_2$Sn$_2$O$_7$) is prepared as an important spin ice compound. In the synthesis of this compound, from a solution of 0.1 mol of Tin (IV) chloride pentahydrate (SnCl$_4·5$H$_2$O) with the addition of Dysprosium (Dy (NO$_3$)$_3·x$H$_2$O) nitrate with molar ratios equal to [Dy / Sn] = 0.1, 0.3, 0.5, 0.7 and 0.1 were used to prepare Dysprosium stannate nanocrystals (Dy$_2$Sn$_2$O$_7$) by hydrothermal method. The effect of Dysprosium (Dy) with different percentages on the formation of Dysprosium stannate composition by annealing at T = 1100 °C in normal environment was investigated. The structural and optical properties of the formed compound were investigated. The results of X-ray diffraction (XRD) patterns of the sample annealed at T=1100 °C showed the formation of nanocrystals in the pyrochlore structure of the Dysprosium stannate with [Dy / Sn] =1. The results of visible-ultraviolet (UV-Vis) spectroscopy showed that the energy gap increases with increasing Dysprosium additive. Field Emission Scanning Microscope (FE-SEM) images confirm the formation of Dysprosium stannatenanocrystals with pyrochlore structure.

Keywords: Pyrochlore oxide phase; Dysprosium stannate; structural properties; hydrothermal method.