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Electrical Properties of the (Copper, Dysprosium)-Containing Complex Compound

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Abstract

A new semiconductor material tetrakis-μ3-(methoxy)(methanol)-pentakis(acetylacetonato) (tricopper(II), dysprosium(III)) (I) was synthesized, with the following composition: [Cu3Dy(AA)5(OCH3)4CH3OH], where HAA=H3C–C(O)–CH2–C(O)–CH3. By data of the elemental analysis and physic-chemical research methods, the obtained complex compound (I) was established to contain atoms of copper (II) and dysprosium (III) in a ratio Cu:Dy = 3:1, and its composition was established to correspond to a gross formula: Cu3DyO15C30H51. The electrical conductivity of the obtained material was measured in compressed form. The following parameters were calculated for the complex compound (I): the number of valence electrons in one molecule was 276; the mass of one molecule was 166.777·10–20 kg; the total number of molecules in a cylindrical sample with a 0.138 g mass and a 19.72·10–9 m3 volume was 8.274·1013 molecules. The resistivity of the pressed sample decreases from 9·1010 to 7·104 Ω·cm in a 303–413 K temperature range. This confirms that the synthesized compound is a semiconductor with a bandgap of 1.38 eV. The conductive properties of the complex compound as a heat-sensitive element were studied. An experimental sample of compressed material with geometric sizes of 1·10–3 m × 0.5·10–3m × 0.5·10–3 m was employed for investigations.

Keywords: semiconductor materials, complex compounds, semiconductors, magnetic fields, conductive properties

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