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Magnetic Properties of Layered Rare-Earth Oxy-Carbonates Ln2O2CO3 (Ln = Nd, Sm, and Dy)

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Abstract : Polycrystalline samples of rare-earth oxy-carbonates Ln2O2CO3 (Ln = Nd, Sm, and Dy) are synthesized, and their structural and magnetic properties are investigated. All of them crystallize in a hexagonal structure with space group P6_3/mmc. They form a double layered structure with frustrated triangular arrangement of rare-earth magnetic ions. An antiferromagnetic transition is observed at TN ≈ 1.25 K, 0.61 K, and 1.21 K for Nd2O2CO3, Sm2O2CO3, and Dy2O2CO3, respectively. From the analysis of magnetic susceptibility, the value of the Curie-Weiss temperature θ_CW is obtained to be ≈ 21.7 K, 18 K, and 10.6 K for Nd2O2CO3, Sm2O2CO3, and Dy2O2CO3, respectively. The magnetic frustration parameter f (= |θ_CW|/T_N) is calculated to be ≈ 17.4, 31, and 8.8 for Nd2O2CO3, Sm2O2CO3, and Dy2O2CO3, respectively which indicates that Sm2O2CO3 is strongly frustrated compared to its Nd and Dy analogues.

Keywords : chemical synthesis, exchange and superexchange, heat capacity, magnetically ordered materials
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