Selective microwave absorption in Nd^{3+} substituted barium ferrite composites

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Abstract	Microwave (MW) frequency based wireless communications and electronic devices became prospective due to several ramifications. To meet this need, a series of neodymium ions (Nd3+) substituted barium ferrite composites with composition (20)BaO:(80-x)Fe2O3:(x)Nd2O3 (0 <= x <= 3 mol%) was prepared at 1100 degrees C using solid-state reaction method. We evaluated the effect of various Nd3+ ions contents on the surface morphology, structure, and magnetic properties of the as-synthesized barium ferrite composites. Meanwhile, microwave reflection loss, complex permittivity and permeability were determined using the transmission/reflection line method in the X-band (8-12 GHz). SEM image of the composites shows that the surface morphology consists of rough and porous microstructures. XRD patterns of the un-doped composites reveal the existence of BaFe12O19 (hexagonal) and Fe21.333O32 (tetragonal) crystalline phases. Furthermore, a new hexagonal crystalline phase of Ba6Nd2Fe4O15 with the crystallite sizes between 15 and 67 nm is observed due to Nd3+ ions substitution in the composite. The saturation magnetization of the composite containing 2 mol% of Nd3+ does not exhibit any significant alteration compared to the one devoid of Nd3+. The complex relative permitivity and permeability of the achieved composites enriched in Ba6Nd2Fe4O15 and BaFe2O4 phases disclose significant MW frequency dependence. The composites also display selective MW absorption in the X-band which could be useful for diverse applications. (C) 2019 Chinese Society of Rare Earths. Published by Elsevier B.V.
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