Impact of ZnO substitution on magnetic response and microwave absorption capability of strontium-natural nanoferrites

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Abstract	Ferrite being a compound derived from iron oxides including magnetite and hematite possesses similar properties as ceramics which are hard and brittle. Certainly, the mounting demand for electronics has been a major factor driving the exponential growth of ferrite based materials. ZnO doped strontium-natural nanoferrites of composition (80 - x) Fe2O3:xZnO:20SrCO(3), where x = 0, 10, 20 mol% are synthesized and sintered via the solid state reaction scheme. Samples are characterized by SEM, XRD, VSM, and VNA measurements to determine the impact of ZnO contents' variation on the surface morphology, structure, magnetic and microwave absorption properties. The Nicolson-Ross-Weir method is applied to evaluate samples' reflection loss. The average grain size of the strontium ferrite is found to reduce with the increase in ZnO concentration. Materials sintered at 1100 degrees C without ZnO incorporation are composed of hexagonal SrFe12O19. Meanwhile, the addition of ZnO produces cubic ZnFe2O4 and SrFeO2 phases. Insertion of ZnO results in reduction of magnetic parameters and reflection loss. Furthermore, the anisotropy magnetic field of strontium natural ferrites displays a rapid drop from 350 kA/m to 79.6 kA/m with the increase in ZnO. Strontium ferrite containing 20 mol% of ZnO exhibits superior microwave absorption with reflection loss within -45 dB to -55.94 dB in the frequency range of 7-13 GHz. This facilely synthesized a new class of materials which is believed to be economically promising for microwave absorption applications in the GHz range. (C) 2015 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
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