

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

Publons ID	9442220
Wos ID	WOS:000369890700051
Doi	10.1016/j.rinp.2015.09.002
Title	Impact of ZnO substitution on magnetic response and microwave absorption capability of strontium-natural nanoferrites
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Publish Date	2015
Journal Name	RESULTS IN PHYSICS
Citation	10
Abstract	<p>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 $(80 - x) \text{Fe}_2\text{O}_3 : x \text{ZnO} : 20 \text{SrCO}_3$, 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 $\text{SrFe}_{12}\text{O}_{19}$. Meanwhile, the addition of ZnO produces cubic ZnFe_2O_4 and SrFeO_2 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/).</p>
Publish Type	Journal
Publish Year	2015
Page Begin	253
Page End	256
Issn	2211-3797
Eissn	
Url	https://www.webofscience.com/wos/woscc/full-record/WOS:000369890700051
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