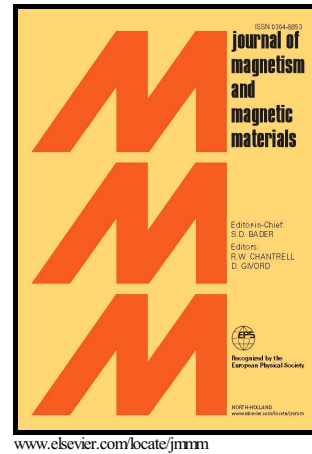


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N.B. Ibrahim, A.Z. Arsad



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Investigation of nanostructural, optical and magnetic properties of Cerium-substituted yttrium iron garnet films prepared by a sol gel method

N. B. Ibrahim and A.Z. Arsad

*School of Applied Physics, Faculty of Science and Technology, Universiti Kebangsaan Malaysia,
43600 Bangi Selangor*

**Corresponding author: baayah@ukm.edu.my*

Abstract

Cerium substituted yttrium iron garnet films with a chemical formula $Y_{3-x}Ce_xFe_5O_{12}$ ($x = 0.0-0.3$) have been successfully prepared by a sol-gel method. The microstructure analysis showed that all films exist in the cubic garnet structure. The lattice parameter and grain size increased with the increment of Ce concentrations up to 0.25, indicating the complete Ce substitution in yttrium site. For a film with $x = 0.3$, the lattice parameter remained unchanged and grain size decreased. The film thickness increased and surface roughness varied with the increment of Ce content. All of the films have high optical transparency (above 80%). The Ce content reduced the saturation magnetization of the film up to a certain limit where above this limit the value increased. Overall, the findings showed that the films with $x \leq 0.25$ exhibited very excellent properties, hence they are promising materials for magneto-optical devices.

Keywords

Cerium- Yttrium iron garnet; Sol-gel method; Solubility limit; Surface morphology

1. Introduction

Recently, yttrium iron garnet (YIG) films have been extensively used in magneto-optical applications such as optical isolators and magnetic field sensors [1-3] due to their good characteristic in Faraday rotation. Since the demands in the applications keep on increasing,

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