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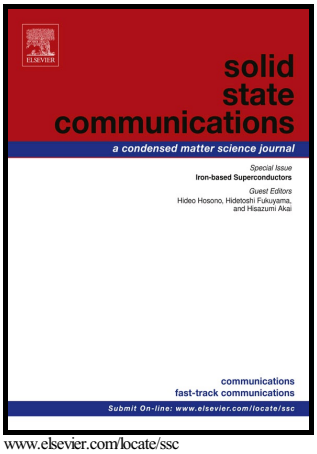

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Microstructure and Magnetic Behavior of Mn doped GeTe Chalcogenide semiconductors Based Phase Change Materials

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Abstract

Phase-change materials (PCMs) are the most promising candidates to be used as an active media in the universal data storage and spintronic devices, due to their large differences in physical properties of the amorphous-crystalline phase transition behavior. In the present study, the microstructure, magnetic and electrical behaviors of $Ge_{0.94}Mn_{0.06}Te$ thin film were investigated. The crystallographic structure of $Ge_{0.94}Mn_{0.06}Te$ thin film was studied sing X-ray diffractometer (XRD) and High Resolution Transmission Electron Microscope (HR-TEM). The XRD pattern showed that the crystallization structure of the film was rhombohedral phase for GeTe with a preference (202) orientation. The HR-TEM image of the crystalline $Ge_{0.94}Mn_{0.06}Te$ thin film demonstrated that, there were two large crystallites and small amorphous areas. The magnetization as a function of the magnetic field analyses of both amorphous and crystalline states showed the ferromagnetic hysteretic behaviors. Then, the hole carriers concentration of the film was measured and it found to be greater than 10^{21} cm^{-3} at room temperature. Moreover, the anomalous of Hall Effect (AHE) was clearly observed for the measuring temperatures 5, 10 and 50 K. The results demonstrated that the magnitude of AHE decreased when the temperature was increasing.

Keywords

Phase change magnetic materials, crystallographic structure, magnetic behaviors, carrier concentration, anomalous Hall Effect

1 INTRODUCTION

Chalcogenide semiconductors-based phase change materials have been attracted by a considerable research attention in the last two decades, due to their excellent properties in a wide range of applications. The principle of these applications is based on remarkable changes in their properties of amorphous and crystalline phases of the chalcogenide materials.