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Granular magnetoresistive films preparation and characterization

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Granular magnetoresistive films were prepared using thermionic vacuum arc (TVA) method [1] in order to infer their optical and electrical behavior in a magnetic field. GMR and TMR films were obtained igniting inside the vacuum chamber three TVA simultaneous discharges. The emitted electrons were focused on tungsten coated carbon crucible anodes, filled with Cu, MgO and Permalloy, respectively. The anode applied voltages for Cu, MgO and Permalloy were up to 1500 V, 1700V and 1600V, respectively. Before and after the deposition, copper electrodes were coated on the substrates, using the same deposition method in order to ensure the accuracy of the electrical measurements. An adjustment of the geometrical parameters like the distance between the cathodes and anodes, and of the external parameters like the anodes voltage and the filaments current was made. Morphological and structural properties of the prepared films were analyzed by transmission and scanning electron microscopies (TEM and SEM). The behavior of the obtained films was first analyzed in a Magneto-Optical Kerr Effect (MOKE) experiment. The electrical resistance behavior of the prepared films was determined in a magnetic field which values varied from 0.1 T to - 0.1 T. The important changes in the values of the electrical resistance of the films were observed and correlated to the preparation conditions.

[1] I. Mustata, C. P. Lungu, A. M. Lungu, V. Zaruschi, M. Blideran and V. Ciupina, Vacuum, 76, 131 (2004)

Keywords

Thermionic vacuum arc

GMR

TMR

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MOKE