

PLASMA PROCESSING OF TUNNELING MAGNETORESISTIVE STRUCTURES

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Tunnelling magnetoresistive structures (TMR) were prepared using the original method developed at the National Institute for Laser, Plasma and Radiation Physics, Bucharest, Romania, called thermionic vacuum arc (TVA) [1-2]. By this method the prepared film condenses in high vacuum conditions, the growing thin film being bombarded with the own ions of the just depositing material. Preparation of the tunnelling magnetoresistive (TMR) structures is based in the work on the properties of magnesium oxide (MgO) such as high electrical resistivity, good chemical resistance and good thermal stability. The prepared TMR structures include magnetic domains (made of Co, Ni, Fe) embedded in a dielectric matrix (MgO) expected to give a high change of the electrical resistance in the presence of a magnetic field, property that can be used for memory devices and read head applications.

The influence of the bombardment with energetic ions (with controlled intensity) generated in the vacuum evaporated ferromagnetic metal co-deposited with the insulator matrix, as well as the electrical characteristics, morphology and structures of the prepared magnetoresistive films were studied. The methods used for characterization were: current in plane (CIP) method, atomic force microscopy (AFM), X-ray diffraction (XRD), scanning electron microscopy (SEM) and transmission electron spectroscopy (TEM). MgO-Me (Me = Co, Ni, Fe) structures having 60-70% Me concentration showed the highest TMR effect.

References:

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