

Study of structural and magnetic properties by 1 MeV C⁺ ion-irradiation on epitaxial Cu/Ni/Cu films

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Various experimental measurements were employed to reveal changes in structural and magnetic properties of epitaxial Cu/Ni($t=30, 60, \text{ and } 90\text{\AA}$)/Cu(002) thin films before and after 1 MeV C⁺ ion-irradiation. Wide and grazing angle x-ray diffraction experiments were carried out to understand in-plane and out-of-plane strain, and anomalous x-ray reflectivity measurements were performed to characterize film properties such as thickness, intermixing and roughness of the each layer, respectively. MOKE measurements were carried out to investigate a perpendicular magnetic property in the films before and after ion-irradiation. Also, torque magnetometer measurements were carried out to understand correlations between magnetic and structural properties. The observed results show that effective magnetic anisotropy value is negative over the entire nickel thickness range and the dominant factor of the modification from out-of-plane to in-plane magnetization is reduction of the interface magnetic anisotropy coefficient in spite of decreased interface mixing after ion-irradiation.

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