

【S-03】

Effects of ion irradiation on epitaxial Cu/Ni/Cu(001) with perpendicular magnetic anisotropy

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Epitaxial fcc Cu/Ni(t)/Cu(001) structures (t=20, 30, 60, 90) possessing perpendicular magnetic anisotropy (PMA) were irradiated by 1 MeV C⁺ with a dose of 21016 ions/cm². The spin reorientation transitions (SRT) from perpendicular to in-plane magnetization occurred after ion irradiation. X-ray diffraction (XRD) measurements showed that the crystal structures were conserved, and the grain size of Cu in the Cu/Ni(60, 90)/Cu(001) films increased by 38 %, but the strain in the Ni layer was relaxed, compared with the as-deposited samples. It is concluded that the spin reorientation transition is caused by the relaxation of the strain in Ni layer, which is initiated by ion irradiation.