The Influence of He$^+$ Ion Bombardment on Magnetic Properties of NiFe/Au/Co/Au Multilayers

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The influence of helium ion bombardment on magnetoresistance (MR), magnetization reversal and domain structure of sputtered \( \text{Ni}_{20}\text{Fe}_{80}-2\text{nm}/\text{Au}-2\text{nm}/\text{Co-0.6nm}/\text{Au-2nm} \) \( \times \) 10 multilayers (MLs) was investigated. The MLs consist of ferromagnetic layers with alternating in-plane (NiFe) and out-of-plane (Co) magnetic anisotropy. The samples were bombarded by He$^+$ (30 keV) ions with fluences varied in the range \( 10^{13} \leq D \leq 3 \times 10^{16} \) He$^+$/cm$^2$. With increasing fluences of helium ions the following changes in magnetic properties were observed: (i) the saturation field of Co layers exponentially decays what is caused by a transition from the out-of-plane to the in-plane anisotropy of Co layers, (ii) the MR decreases progressively whereas the resistance remains almost constant (up to \( 4 \times 10^{15} \) He$^+$/cm$^2$), only for higher fluences it strongly increases, (iii) the period of maze stripe domain linearly decreases with \( \log(D) \). However, domain structure for \( D=3 \times 10^{16} \) He$^+$/cm$^2$ is hardly visible.

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