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**Title**: Studies of some physical properties of $PrFe_{0.7}Ni_{0.3}O_3$ thin films after 200 MeV $Ag^{15+}$ irradiation

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Abstract

Jammu and Kashmir 190 006, India; $PrFe_{0.7}Ni_{0.3}O_3$ thin films (thickness ~ 200 nm) were prepared by pulsed laser ablation technique on $LaAlO_3$ substrate. These films were irradiated with 200 MeV $Ag^{15+}$ ions at various fluencies, ranging from $1 \times 10^{11}$ to $1 \times 10^{12}$ ions/cm$^2$. These irradiated thin films were characterized by using X-ray diffraction, dc conductivity, dc magnetization and atomic force microscopy. These films exhibit orthorhombic structure and retain it even after irradiations. The crystallite size (110–137 nm), micro strain ($1.48 \times 10^{-2}$–$1.75 \times 10^{-2}$ line$^{-2}$ m$^{-4}$) and dislocation density ($79.7 \times 10^{14}$–$53.2 \times 10^{14}$ line/m$^2$) vary with ion fluencies. An enhancement in resistivity at certain fluence and then a decrease in its value (0.22175–0.21813 Ω cm) are seen. A drastic change in observed magnetism after ion irradiation is seen. With ion irradiation, an increase in surface roughness, due to the formation of hillocks and other factors, is observed. Destruction of magnetic domains after irradiation can also be visualized with magnetic force microscopy and is in close agreement with magnetization data. The impact on various physical properties in these thin films after irradiation indicates a distortion in the lattice structure and consequently on single-particle band width caused by stress-induced defects.

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