

SAIP2014



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The behaviour of damage in sapphire and MgO implanted with silver ions

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Abstract :

The study was performed with the crystals of MgO and α -Al₂O₃ and implanted with 150 keV silver ions. The depth and distribution of the implanted ions were analyzed by Rutherford Backscattering Spectrometry and Transmission Electron Microscopy. The degree of damage and the morphology of ion implantation generated nanostructures within crystalline matrices is strongly dependant on the crystal orientation. The cross section Transmission Electron Microscopy analysis shows that the damaged by ion implantation area, which extends from the surface into the sample bulk consists of regions of distinct morphology. The closest to the surface zone is silver nanoparticles (NP) rich. The nanoparticles show crystalline structure in both materials. This region, despite very high concentration of silver NPs, preserved its crystallinity, better in MgO than in sapphire, implanted under the same conditions. The NPs show broad size distribution, with ranges from about 1 nm to 15 nm. The similar phenomenon was observed in sapphire powder samples. The NPs there were spilled to carbon supportive film, with much larger average sizes than in the substrate. The zones beyond silver ions range, show considerable damage of different character with preserved crystal structure and low concentration of silver ions. The depth profile is consistent with SRIM calculations in sapphire, but differs in MgO.

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