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Ion irradiation effects on the formation of metal nanoparticles in crystals

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Metal nanoparticles (MNP) were synthesized by room temperature ion implantation of high fluences (from 6×10^{16} to 5×10^{17} cm⁻²) of 150 keV Ag and 15 - 22 MeV Au ions into Al₂O₃ and MgO single crystals. Optical absorption (OA) spectra show surface plasmon resonance (SPR) bands characteristic of the implanted metal ions. Upon annealing (300°-1200°C) the optical response of the metal nanostructures changes, related directly to their morphology, shape and size. High resolution transmission electron micrographs indicate that the particles are often crystalline. The implanted ions profiles were obtained from 1.6 MeV He⁺ Rutherford Backscattering (RBS) for the silver implanted substrates and High Resolution Transmission Electron Microscopy (HRTEM), revealed buried layers of implanted ions.

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