

Title: Structural and optical studies of Au doped titanium oxide films

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Abstract: Thin films of TiO₂ were doped with Au by ion implantation and in situ during the deposition. The films were grown by reactive magnetron sputtering and deposited in silicon and glass substrates at a temperature around 150 degrees C. The undoped films were implanted with Au fluences in the range of 5×10^{15} Au/cm²- 1×10^{17} Au/cm² with a energy of 150 keV. At a fluence of 5×10^{16} Au/cm² the formation of Au nanoclusters in the films is observed during the implantation at room temperature. The clustering process starts to occur during the implantation where XRD estimates the presence of 3-5 nm precipitates. After annealing in a reducing atmosphere, the small precipitates coalesce into larger ones following an Ostwald ripening mechanism. In situ XRD studies reveal that Au atoms start to coalesce at 350 degrees C, reaching the precipitates dimensions larger than 40 nm at 600 degrees C. Annealing above 700 degrees C promotes drastic changes in the Au profile of in situ doped films with the formation of two Au rich regions at the interface and surface respectively. The optical properties reveal the presence of a broad band centered at 550 nm related to the plasmon resonance of gold particles visible in AFM maps. (C) 2011 Elsevier B.V. All rights reserved.

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