

TiN nanoparticles: Small size-selected fabrication and their quantum size effect

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Abstract

Size-selected TiN nanoclusters in the range of 4 to 20 nm have been produced by an ionized cluster beam, which combines a glow-discharge sputtering with an inert gas condensation technique. With this method, by controlling the experimental conditions, it was possible to produce nanoparticles with a high control in size. The size distribution of TiN nanoparticles was determined before deposition by mass spectroscopy and confirmed by atomic force microscopy. The size distribution was also analyzed using a high-resolution transmission electron micrograph. The photoluminescence [PL] spectra of TiN nanoparticles at different sizes were also experimentally investigated. We reported, for the first time, the strong visible luminescence of TiN nanoparticles on Si (111) wafer due to the reduced size. We also discussed the PL intensity as a function of the nanoparticle size distribution. © 2012 Mainet et al.

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