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**Titanium and titanium nitride thin films grown by dc reactive magnetron sputtering
Physical Vapor Deposition in a continuous mode on stainless steel wires: chemical,
morphological and structural investigations**

S. Grosso¹, L. Latu-Romain^{1*}, G. Berthomé¹, G. Renou¹, T. Le Coz², M. Mantel^{1,2}

¹ *Univ. Grenoble Alpes, CNRS, Grenoble INP**, SIMaP, F-38000 Grenoble, France*

² *Ugitech, Centre de Recherche, Av. Paul Girod, 73400 Ugine, France*

**E-mail: laurence.latu-romain@simap.grenoble-inp.fr*

**Phone : +334 76 82 65 06*

*** Institute of Engineering Univ. Grenoble Alpes*

Abstract

Ti and TiN thin films (50-140 nm thick) are grown by dc reactive magnetron sputtering PVD in an inverted cylindrical magnetron (ICM) thanks to an original industrial process corresponding to a continuous reactive deposition on moving stainless steel wires. Thin films are fully characterized by Xray Photoelectron Spectroscopy, Transmission Electron Microscopy coupled with Energy Dispersive Spectroscopy and Orientation Phase Mapping. The stoichiometry of TiN is adjusted thanks to N₂ flow. At the beginning of poisoned mode, golden stoichiometric TiN thin films are obtained. In the metallic mode, greyish TiN_x films are grown whereas at higher N₂ flow, TiN_xO_y films are synthesized with preferential O incorporation instead of N enrichment. Grain orientation maps reveal that Ti and TiN thin films are highly polycrystalline: Ti films have an equiaxial morphology whereas TiN thin films have a tendency to present <111> columnar grains with <001> oriented grains at the nucleation step. Finally, a low temperature of growth (of about 350 °C and < 650 °C) is needed in order to prevent chemical diffusion from the stainless steel substrate into the rich-titanium films.

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