

PO2009

### **Titanium alkoxide precursor for Ti based nano-composites films obtained by pulsed plasma PECVD**

Vinícius Antunes<sup>1</sup>, J.J.S. Acuña<sup>2</sup>, R. Droppa Jr.<sup>3</sup>, A.R. Zanatta<sup>4</sup>, L.F. Zagonel<sup>5</sup>, M. Morales<sup>6</sup>, S. Cucatti<sup>7</sup>, F. Alvarez<sup>7</sup>

<sup>1</sup>Universidade Estadual de Campinas, Campinas, Brazil <sup>2</sup>LCME, UFSC, Florianópolis, Brazil <sup>3</sup>CCNH, UFABC, Santo Adre, SP, Brazil <sup>4</sup>IFSC, USP, São Carlos, SP, Brazil <sup>5</sup>LNLS, Campinas, SP, Brazil <sup>6</sup>IF, Unicamp, Campinas, SP, Brazil <sup>7</sup>IF, UNICAMP, Campinas, SP, Brazil

vantunes@ifi.unicamp.br

Titanium based thin films such as TiC and TiN are used as wear-resistant coatings due to their good chemical stability, high hardness, and high melting point. The hardness in nano-composite materials are related to the so call *grain sliding phenomenon*.(1) This is so because on decreasing grains size the number of atoms at the crystallite surface starts to be comparable with those of the bulk ones. Consequently, at the nanometer grain size scale the interatomic forces dominate the hardness properties of the material rather that dislocations. Therefore, local inhomogeneous materials ("nano-composites") are an alternative to solid solution hard coatings. In the preparation of Ti based films, TiCl<sub>4</sub> is commonly used as a precursor, but besides the inconvenient to handle a strongly corrosive compound, chlorine residues tends to degrade the properties of the films. Ti-containing alkoxides are an interesting alternative source for deposition of Ti(C:N:O) films, because they are easily handled and they are not toxic thought that they are hygroscopic. In this paper we report the results obtained depositing thin nanocomposites films by Pulsed Plasma Enhanced Chemical Vapor Deposition (PPECVD) from *Titanium(IV)ethoxide* (Ti(OC<sub>2</sub>H<sub>5</sub>)<sub>4</sub>) liquid source. The material was analyzed by Photoemission Electron Spectroscopy (XPS), Raman Spectroscopy, X-ray Diffraction (DRX), Raman spectroscopy, and Electron Energy Loss Spectroscopy (EELS). The morphology was studied using Transmission Electron Microscopy (TEM). The results indicate the formation of a nano-composite with different nano sized compounds such as TiC, TiN, and TiO. The influence of the deposition conditions on the nano-structure as well as the nano-hardness are presented and discussed. (1) J. Musil, Surf. Coat. Techn. 125, 322, (2000)

#### **Keywords**

Nano-composites

Pulsed Plasma, PECVD

Alkoxide