Properties of nc-TiC/a-C:H films prepared by PVD-PECVD process at low and high ion bombardment

Pavel Soucek¹, Tereza Schmidtova¹, Lukas Zabransky¹, Vilma Bursikova¹, Petr Vasina¹

¹Masaryk University, Brno, Czech Republic
soucek@physics.muni.cz

Two sets of nc-TiC/a-C:H coatings with varying chemical composition were prepared using a hybrid PVD-PECVD deposition process combining sputtering of titanium target in argon/acetylene. The range of chemical compositions was chosen appropriately to optimize the hardness of the coatings - from 30at. % to 70 at. % Ti. The films were approx. 5 μm thick with 700 nm titanium interlayer to promote the adhesion of the films to cemented tungsten carbide and high speed steel substrates.

The desired ion bombardment was achieved by employing different magnetic fields on the cathode. On one hand a well-balanced magnetic field was used for low ion bombardment of the growing film and on the other hand a strongly unbalanced magnetic field was used for high bombardment. All other deposition parameters such as pressure and substrate temperature were kept constant for both magnetic field configurations as to single out the effect of the ion bombardment on the growing film.

The main goal of this contribution is focused on comparison of structure, chemical composition, and mechanical properties of the coatings prepared at different ion bombardment conditions. Time evolution of the deposition process is also taken into account.

Acknowledgments This research has been supported by GACR contracts 104/09/H080, 205/12/047 and R&D center project for low-cost plasma and nanotechnology surface modifications CZ.1.05/2.1.00/03.0086 funded by European Regional Development Fund. Pavel Souček acknowledges the Brno City Municipality as Holder of Brno PhD Talent Financial Aid.

Keywords
nanocomposite
titanium
carbon
mechanical properties