

**AlTiN coatings deposited by HIPIMS: A study of mechanical properties, tribological and wear performance during machining of superduplex stainless steel.**

**J. Paiva, E. Locks, Y. Ahmed, P. Stolf, J. Dosbaeva, C. Bork, G. Fox Rabinovich and S. C. Veldhuis.**

AlTiN PVD coatings represent a generation of coatings designed to work at high temperature applications. The aluminum in the film converts to aluminum oxide as the coating heats up, resulting in increased oxidation resistance. The use of this coating is related to the cutting tool applications where a lot of heat is generated. In this work, an advanced High Power Impulse Magnetron Sputtering (HIPIMS) technique was utilized to deposit dense AlTiN coatings on cemented carbide cutting inserts. The influence of HIPIMS process deposition was compared with AlTiN PVD Coating deposited by Arc method and evaluated in terms of microstructure, mechanical and tribological properties, by means of SEM /EDS, XRD structural characterization, nanoindentation testing, and Pin-on disc high temperature tribotesting. To relate the coatings properties with the wear performance, cutting tests were performed during turning of superduplex stainless steels at finishing operations. FEM modeling of the turning process was employed to determine the cutting temperatures, cutting forces and stresses at the cutting tool edge. The results obtained demonstrate that the tribological and wear performance of the AlTiN PVD coatings deposited by HIPIMS showed significantly improved wear behavior as compared to arc deposited AlTiN coating. This is because HIPIMS process allows to deposit very dense, defect free coatings, with low residual stresses and excellent surface finish that improves wear performance of the coated tool.

**Key-words:** AlTiN PVD coating, HIPIMS, Arc, Mechanical properties, Machining, Superduplex stainless steel.