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Characterization of Nanostructured TiN and ZrN thin films elaborated by reactive magnetron sputteringCHALA ABDELOUAHAD¹, CHAHINEZ SIAD¹¹University of Biskra, Biskra, Algeria

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The present work deals with structural, mechanical and tribological characterization of nanostructure of nitrides based films (ZrN, TiN) for cutting tool applications. Coatings are deposited by reactive magnetron sputtering from metallic targets (Ti, Zr and B) on static substrate holders with RF or DC bias.

Thermo chemical treatments by plasma nitrided have been held on steel substrates for eventual duplex applications.

The influence of plasma parameters (nitrogen partial pressure and substrate bias) on mechanical properties of ZrN and TiN is studied. In order to improve its mechanical properties, bore is then introduced to TiN and ZrN thin films. The fraction of bore into the coatings is then increased in order to achieve the formation of ZrBN and TiBN nanocomposite. Chemical, mechanical, tribological and structural properties are studied as a function of bore content using XPS, FTIR and nano-indentation, Scratch tests, XRD, SEM and TEM techniques. C-BN and h-BN phases are detected from 1 at.% of bore by XPS measurements.

An increase of the hardness is observed while adding bore to nitrides with two maximum at 5 and 10 at.% of bore. The resistance corrosion is also studied as function of deposition conditions.

Keywords

reactive magnetron sputtering
thin films
nanocomposites
tribological properties