

PO3020

**Optimisation of multi-layer AlTiN coatings for improved wear resistance**

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In order to improve the mechanical behavior of AlTiN coatings on cutting tools we varied aluminium content and layer architecture. Deposition was done in an industrial scale PVD unit using cathodic arc evaporation of Ti and AlTi with compositions ranging from 50 to 70 at. %. Monolithic and multi-layers were deposited on cemented carbide samples keeping the coating thickness between 3 to 4 micron. Basic mechanical properties like coating hardness and elastic modulus were determined by nano-indentation. Adhesion and toughness were characterised by indentation with a diamond tip. Film structure and chemistry was determined using EDX and XRD. Wear resistance of the coated substrates was analysed in cyclic impact tests with a polished carbide ball. The results are compared to realistic drilling tests with heat-treated steel 42CrMo4 (TRS=900 MPa) and turning tests in cast iron (mainly abrasive wear component). It was found that turning tests matched the impact tests better than drilling likely due to difference in loading (shear and torque forces in drilling). Nevertheless, we will demonstrate that a multi-layer design is better able to protect the substrate (tool) against abrasion and fatigue wear components than monolithic coatings.

**Keywords**

arc PVD  
coating  
wear  
cutting tool  
drilling