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Tribological properties of highly oriented Ti(C,N) deposited by chemical vapor deposition

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Abstract

Two Ti(C,N) coatings were tested by means of micro abrasion and scratch testing. The coatings differed in grain size, orientation (<111> and <111>, <311> and <211> respectively) and hardness (36 GPa and 23 GPa respectively). The <111> oriented coating had a 20% higher wear resistance compared to the reference coating when abraded with 1 µm diamonds. When abraded with 6 µm diamonds the abrasion resistance of the reference coating was superior compared to the <111> oriented coating by 36%. Furthermore, it was found that the <111> oriented coating had 35 % better adhesion compared to the reference. The improved mechanical properties of the <111> oriented coating was attributed to a high degree of orientation and the higher hardness.

Key words: Hard coating, Coating adhesion, Abrasive wear, CVD coating

1. Introduction

Surface modification by means of chemical vapor deposition (CVD) has been used to enhance material properties for decades. CVD is currently used in many different areas such as; electronics, photovoltaics, optics and protective coatings. Hard protective coatings by CVD are routinely used in the cutting tool manufacturing industry, where most of the tools have a multi-layer coating system, often in the sequence: TiN-Ti(C,N)-α-Al_2O_3. The TiN layer closest to the

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