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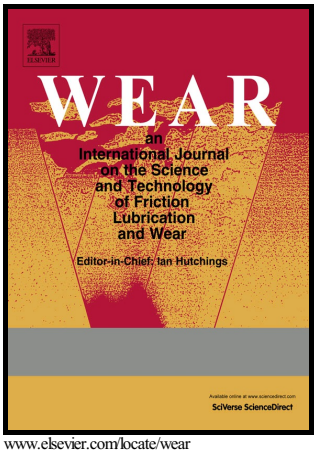

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Influence of cutting speed and workpiece material on the wear mechanisms of CVD TiCN/α-Al_2O_3 coated cutting inserts during turning

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Abstract

Although several studies are available discussing wear of coated cutting inserts during turning, there is still a lack in understanding of the dominating wear mechanisms. Thus, the present work focuses on investigation of wear mechanisms after longitudinal turning with CVD TiCN/α-Al_2O_3 coated cemented carbide cutting inserts. Three different steels, 42CrMo4, Ck60 and 100Cr6, were used as workpiece materials. In addition, the cutting speed was varied between 150 and 250 m/min. The used cutting inserts were investigated by optical microscopy after different stages of lifetime. Cross-sections within the crater region were prepared to evaluate the crater wear as well as the contribution of plastic deformation of the cemented carbide to the blunting of the cutting edge. Scanning electron microscopy was applied for a detailed investigation of the worn regions. Significant differences in tool life could be observed for the different workpiece materials and cutting speeds, ranging from 3 min for turning of 42CrMo4 to 26 min for 100Cr6 at the highest cutting speed and from 46 min for 42CrMo4 to 94 min for Ck60 at the lowest cutting speed. The differing tool life could be correlated with the microstructure and mechanical properties of the respective workpiece materials.

Keywords: turning, wear, cemented carbide, hard coatings, cutting inserts, workpiece material