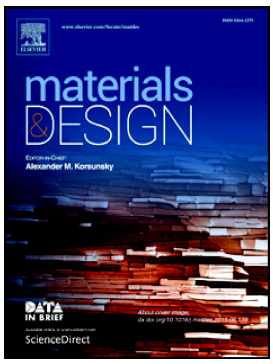

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Mechanisms of WC plastic deformation in cemented carbide

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Abstract

The WC-Co cemented carbides with ultracoarse and ultrafine grain structures were tested by the bonded interface technique to investigate the deformation behaviour of WC. The electron backscattering diffraction assisted trace analysis and transmission electron microscopy were combined to examine the microstructural details in the deformation region. It was found that the plastic characteristics of the ultracoarse WC originate from both the prismatic (e.g. $\{10\bar{1}0\}<\bar{1}2\bar{1}3>$) and pyramidal (e.g. $\{0\bar{1}11\}<0\bar{1}10>$) slip systems. The deformation mechanisms of the ultracoarse and ultrafine cemented carbides were compared. It was proposed that different from the ultrafine cemented carbides in which the plastic deformation is mainly attributed to the metal binder, the dislocations and stacking faults in WC make significant contributions to the plastic deformation hence the fracture toughness of the ultracoarse cemented carbide.

Keywords: Cemented carbides; Deformation; Microstructure; Dislocation

1. Introduction

Cemented carbides, which are composed of hard ceramic phase (e.g. WC or TiC) as matrix and ductile metal (e.g. Co or Ni) as binder, are widely used as drilling tools due to their high hardness, wear-resistance and fracture strength [1]. When applied under impacting