WEAR RESISTANCE OF CEMENTED TUNGSTEN CARBIDES

Cemented tungsten carbides are generally used as wear parts and cutting tools in the manufacturing industry due to their excellent hardness and moderate toughness

In order to improve the lifespan and machining performance of the cutting tools, hard coatings are applied to the inserts [1]. During operation these coatings have been known to delaminate and/or chip at high speeds [2] and thus there is a need to improve their properties.

A surface modification technique which has been used with some success is ion implantation. This process uses high speeds and energies to implant metal and non-metal ions into the surface of a material. This causes strain hardening of the surface layers which increases the hardness and compressive stresses; it has also been shown to cause closure of micro-cracks and micro-voids [3-5].

"A webinar on 5 June will provide a comparison between the machining performance of ion implanted and non-ion implanted cemented tungsten carbide inserts in the machining of steel."

Ion implantation of coated cemented tungsten carbides with elements such as N, Ni, Ti, and Si have led to increased hardness and wear resistance, resulting in increased tool lifetimes and up to a 50% increase in production rates [6-8].

It has been noted that N ion implantation, is generally only suitable for applications in mild abrasive wear conditions [6]. Studies conducted using metal ions of Nb, V and Mo has also shown increased hardness and wear resistance without compromising the adhesion of the coatings on the tool surface [8-9].

In some instances the improvement of the surface properties is due to the formation of new phases which form during ion implantation [10].

To date, the majority of the machining test research on the use of ion implantation in cemented tungsten carbide tools has been limited to turning, grooving and end milling [5,7,8,11]. Therefore the focus of the research currently being conducted at Wits University is centred on face milling tools. A summary of the research will be presented via a SAIT webinar on 5 June and will provide a comparison between the machining performance of ion implanted and non-ion implanted cemented tungsten carbide inserts in the machining of steel.

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