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# Investigation of the tribological behaviour of WC/TiC based cermets in contact with Al<sub>2</sub>O<sub>3</sub> alumina under high temperature

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## Abstract:

WC/TiC-based cermets are, generally, considered as potential alloys widely used in hot rolling industry because of their interesting properties, namely high resistance to wear and oxidation. This work was aimed at studying the tribological behaviour, at relatively high temperature, of WC/TiC-based cermets prepared using the powder metallurgy procedure. Three WC/TiC-Co cermets were prepared with different titanium carbide (TiC) additions namely 5%, 10% and 15% [in weight percentage (wt.%)], and a tungsten carbide-cobalt (WC-Co) grade without TiC which was considered as a reference material, resulting in a total of four samples. Friction tests were carried out, at two different contact temperatures of 450°C and 650°C, using a tribometer and an alumina ball during 2 h 46 min with load and speed of 20 N and 0.5 m/s, respectively. The obtained friction coefficients indicate that WC/TiC-based grades are relatively stable compared to the reference grade which shows an unstable friction coefficient with many peaks. It was also found that wear rates decreased with increasing TiC content, but exhibited a noticeable increase with rising temperature. Moreover, and in order to characterise the tribological degradation, the wear tracks microstructure composed of 80% WC, 15% Co and 5% of TiC, were analysed using a scanning electron microscope (SEM) process. Consequently, an enhancement of the wear resistance at 650°C was observed, and oxides of various types rich in tungsten, cobalt and oxygen were identified through SEM/energy electron spectrometry (EDS) images.

**Keywords:** cermets, friction, thermo-mechanical, WC-Co-TiC, wear

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