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Influence of temperature on the biaxial strength of cemented carbides with different microstructures

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Abstract. The effect of the temperature on the mechanical strength of WC-Co cemented carbides with different microstructures (grain size and binder content) was evaluated. Biaxial flexural tests were performed on three cemented carbide grades at 600°C using the ball-on-three-balls (B3B) method. Results were interpreted by Weibull statistics and compared to biaxial strength results at room temperature. A detailed fractographic analysis, supported by Linear Elastic Fracture Mechanics, was performed to differentiate the nature and size of critical defects and the mechanism responsible for the fracture. A significant decrease in the mechanical strength (around 30%) was observed at 600ºC for all grades of cemented carbides. This fact was ascribed to the change in the critical flaw population from sub-surface (at room temperature) to surface defects, associated with the selective oxidation of Co. Additionally, an estimation of the fracture toughness at 600°C was attempted for the three cemented carbides, based upon the B3B strength results, the corresponding number of the tested specimens fragments and the macroscopic area of the B3B fracture surfaces. The fracture toughness was not