

# Mechanical Properties and Microstructural Behaviour of Microwave Sintered WC–Co

## Abstract

Abstract: Cemented carbides have been of great interest within industrially manufacturable hard materials for their mechanical properties. Microwave sintering is known for its application on a range of hard materials. Although it has been widely used, its effect on grain growth of materials still requires clear understanding. Three different types of particle size, ranging from 1–3  $\mu\text{m}$  to 100 nm were used for microwave sintering where temperature was used in this study within the range of 1000–1400  $^{\circ}\text{C}$ , while pressure during initial compaction of powder particles was kept constant. The maximum hardness was observed in the order of nearly 1800 Hv for submicron samples, sintered at 1250  $^{\circ}\text{C}$ . Fracture toughness on the samples reached a maximum of 16 MPa  $\sqrt{\text{m}}$  for micron samples sintered at 1400  $^{\circ}\text{C}$ . Grain growth in all samples was not more than 1–3  $\mu\text{m}$ , even without the presence of any commercial grain growth inhibitors as part of the composition. Line scanning between grains demonstrates the presence of homogenous Co, confirming good mechanical behaviour. The microstructural features associated to the sintering process have also been focused as part of the study, highlighting some challenges in the research. Graphic Abstract: Line scanning of WC (1–3  $\mu\text{m}$ )–7.5 wt% Co (1–3  $\mu\text{m}$ ) sample, microwave sintered at 1400  $^{\circ}\text{C}$ [Figure not available: see fulltext.].

## Keywords

Carbide; Compaction; Mechanical behaviour; Microstructure; Microwave