

Sintering of Functionally Graded WC-TiC-Co Cemented Carbides

Authors : Stella Sten, Peter Hedström, Joakim Odqvist, Susanne Norgren

Abstract : Two functionally graded cemented carbide samples have been produced by local addition of Titanium carbide (TiC) to a pressed Tungsten carbide and Cobalt, WC-10 wt% Co, green body prior to sintering, with the aim of creating a gradient in both composition and grain size in the as-sintered component. The two samples differ only by the in-going WC particle size, where one sub-micron and one coarse WC particle size have been chosen for comparison. The produced sintered samples had a gradient, thus a non-homogenous structure. The Titanium (Ti), Cobalt (Co), and Carbon (C) concentration profiles have been investigated using SEM-EDS and WDS; in addition, the Vickers hardness profile has been measured. Moreover, the Ti concentration profile has been simulated using DICTRA software and compared with experimental results. The concentration and hardness profiles show a similar trend for both samples. Ti and C levels decrease, as expected from the area of TiC application, whereas Co increases towards the edge of the samples. The non-homogenous composition affects the number of stable phases and WC grain size evolution. The sample with finer in-going WC grain size shows a shorter gamma (γ) phase zone and a larger difference in WC grain size compared to the coarse-grained sample. Both samples show, independent of the composition, the presence of abnormally large grains.

Keywords : cemented carbide, functional gradient material, grain growth, sintering

Conference Title : ICHMP 2022 : International Conference on Hard Metals Production

Conference Location : Istanbul, Türkiye

Conference Dates : November 29-30, 2022