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Visualisation and Measurement of Hardmetal Microstructures in 3D

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Abstract

2D and 3D measurements of two WC-Co hardmetal alloys have been made using electron backscatter diffraction and focused ion beam microscopy. The 3D network of the Cobalt binder phase has been shown to be comprised of both small isolated Co grains as well as the large interpenetrating grains previously surmised to exist from 2D mapping; grain boundaries between the large Co grains have also been observed for the first time in 3D. 2D and 3D WC grain size distributions are shown to correspond closely, but only if the measurements of small grains are discounted as few grains below about 40% of the mean size are seen in 3D, even though much smaller sections are seen in 2D views. Analysis of grain shape has found the presence of truncated trigonal prisms with faces having the expected basal and prism plane orientations, but it also reveals complex shapes produced by multiple adjacent grains of almost identical orientation.

Highlights

- 3D EBSD reveals new insight into the structure of both WC grains and binder phase in hardmetals
- 3D EBSD shows boundaries between large Co grains and multiple small Co grains.
- 3D and 2D WC grain size distributions are shown to overlap closely if small grains are excluded.
- Excluded small grains in 2D are sections through the tips of much larger grains.

Keywords

Hardmetal, Microstructure, 3D, grain size, binder phase

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