

International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

Balapur P.O., Hyderabad – 500005, Telangana, India



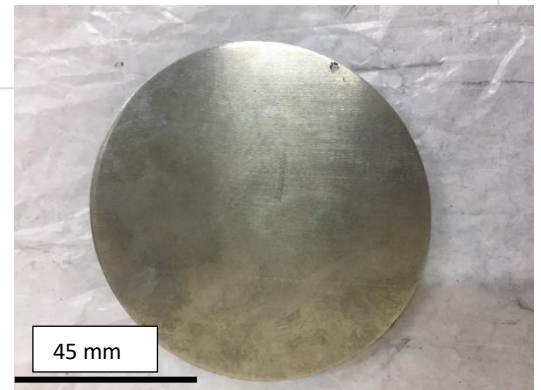
Tungsten- based plates by spark plasma sintering

Overview

Tungsten based structural components are commercially being prepared from wrought tungsten by hot-pressing/sintering followed by hot rolling at high temperatures. An alternate simple PM processing route comprising of blending, milling, reduction and spark plasma sintering could be adopted for fabricating such components. The advantage of such processing is retention of fine grain size with uniform distribution and no abnormal grain growth leading to improved hardness and strength in the sintered components. The role of additives was found to be critical in achieving properties identical to that of hot rolled components. The powder composition and the processing conditions was optimized. Microstructural investigations through SEM and EBSD were carried out to explain the enhanced densification at much lower temperatures and were correlated with the mechanical properties achieved.

Key Features

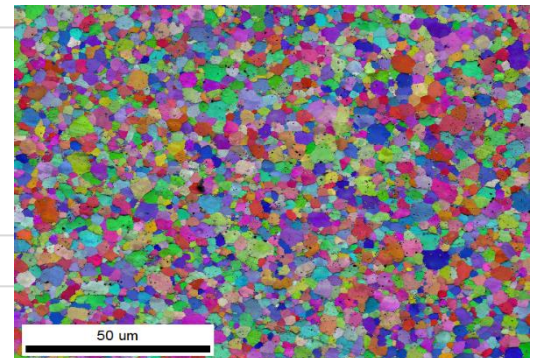
- Fabricated in sizes of 20, 50 and 95 mm diameter upto 10 mm thickness
- Density 98.5% of theoretical with grain size 2-3 μm
- Hardness > 450 HVN and TRS \geq 750 MPa achieved
- Additives play an important role in attaining properties
- Milling, reduction and sintering steps are involved
- Scaled up process for commercial applications
- Alternate PM based route for fabricating W-components



W-plates fabricated by SPS

Potential Applications

- Strategic applications



EBSD showing fully dense fine grained microstructure

Technology Readiness Level (TRL) : 8

- Processing and properties are validated at laboratory scale
- Coupon level demonstrated
- Scaled up technology available

IPDI*	1	2	3	4	5	6	7	8	9	10
Activities	Basic concepts and understanding of underlying scientific principles	Short listing possible applications	Research to prove technical feasibility for targeted application	Coupon level testing in stimulated conditions	Check repeatability/ consistency at coupon level	Prototype testing in real-life conditions	Check repeatability/ consistency at prototype level	Reassessing feasibility (IP, competition technology, commercial)	Initiate technology transfer	Support in stabilizing production
Status										

*IPDI : Intellectual Property Development Indices

Major Patents / Publications

1. Dibyendu Chakravarty, PVV Srinivas and R. Vijay, 'Method of fabricating tungsten based composite sheets by spark plasma sintering technique for making components', Indian Patent application no. **201911014933**, dtd. 13.04.2019

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