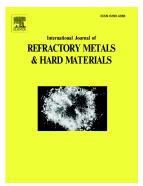
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Study on preparation and property of porous tungsten via tape-casting

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Abstract

A novel method of preparing porous tungsten via tape-casting is developed in this study. Micron-sized bulk porous tungsten with an open, biporous structure with large pores of 3-6 μ m and with small pores of ~1 μ m was successfully fabricated. The morphology of large pore depends on NaCl space-holder, and the uniform porous structure can be attributed to dispersant and binder added in tape-casting slurry which keeps tungsten powders decentralized, make the slurry stable and ordered. Compared with conventional process, the sintering temperature is reduced by at least 300°C with the help of exothermic carburization of tungsten where carbon is introduced in the process of removing organics. W₂C phase was in situ generated on the surface of W particle and became the boundary between W grains. Furthermore, tape-casting samples show typical compressive properties of brittle porous material with higher compressive strength, which is attributed to the hard phase (W₂C) and uniform porous structure. **Keywords:** porous tungsten; tape-casting; microstructure; sintering; compressive property

1. Introduction

Tungsten owns the highest melting temperature, the lowest coefficient of thermal expansion and the highest tensile strength among all metals [1]. Hence, porous tungsten plays a leading role in high temperature and military applications such as high current density cathodes in high power lamps [2], engineering and structural material with excellent dynamic compressive properties [3]. Moreover, it is widely used as scaffolds for tungsten based metal–metal and ceramic–metal composites manufactured

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