

## Accepted Manuscript

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PII: S0263-4368(17)30209-3

DOI: doi: [10.1016/j.ijrmhm.2017.07.018](https://doi.org/10.1016/j.ijrmhm.2017.07.018)

Reference: RMHM 4488

To appear in: *International Journal of Refractory Metals and Hard Materials*

Received date: 3 April 2017

Revised date: 26 July 2017

Accepted date: 31 July 2017

Please cite this article as: Qiang Shen, Dongqing Zhou, Jian Zhang, Guoqiang Luo, Lianmeng Zhang, Study on preparation and property of porous tungsten via tape-casting, *International Journal of Refractory Metals and Hard Materials* (2017), doi: [10.1016/j.ijrmhm.2017.07.018](https://doi.org/10.1016/j.ijrmhm.2017.07.018)

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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  $\mu\text{m}$  and with small pores of  $\sim 1 \mu\text{m}$  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.  $\text{W}_2\text{C}$  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 ( $\text{W}_2\text{C}$ ) 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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