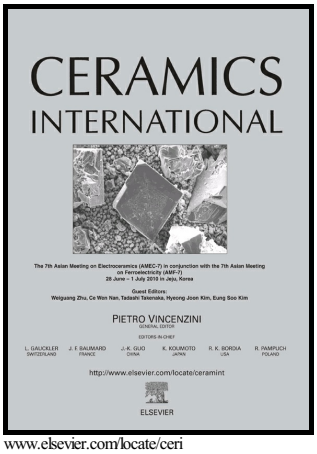

www.elsevier.com/locate/ceri

Synthesis and properties of $(Hf_{1-x}Ta_x)C$ solid solution carbides

Dae-Gwon Ha, Jiwoong Kim, Ji-sun Han, Shinhoo Kang

PII: S0272-8842(18)31877-7
DOI: https://doi.org/10.1016/j.ceramint.2018.07.149
Reference: CERI18871

To appear in: *Ceramics International*

Received date: 6 April 2018
Revised date: 4 July 2018
Accepted date: 16 July 2018

Cite this article as: Dae-Gwon Ha, Jiwoong Kim, Ji-sun Han and Shinhoo Kang, Synthesis and properties of $(Hf_{1-x}Ta_x)C$ solid solution carbides, *Ceramics International,* https://doi.org/10.1016/j.ceramint.2018.07.149

Synthesis and properties of $(Hf_{1-x}Ta_x)C$ solid solution carbides

Dae-Gwon Ha[a], Jiwoong Kim[b,c], Ji-sun Han[a], Shinhoo Kang[a,*]

[a]Department of Material Science and Engineering, Seoul National University, 1 Gwanak-ro, Gwanak-gu, Seoul 08826, Republic of Korea

[b]Mineral Resources Research Division, Korea Institute of Geoscience and Mineral Resources, 124 Gwahang-no, Yuseong-gu, Daejeon 34132, Republic of Korea

[c]NT-IT, Korea University of Science and Technology, 217 Gajeong-ro, Yuseong-gu, Daejeon 34113, Republic of Korea

*Corresponding author. Tel.: +82 2 880 8334. E-mail : shinkang@snu.ac.kr

ABSTRACT

Thermodynamically stable $(Hf_{1-x}Ta_x)C$ ($x = 0.1-0.3$) compositions were selected by First Principle Calculation and synthesized in nanopowders via high-energy ball milling and carbothermal reduction of commercial oxides at 1450 °C. The formation of a solid solution during powder synthesis was investigated. The solid solution carbide powders were sintered at 1900 °C by spark plasma sintering without a sintering aid. As a result, the $(Hf_{1-x}Ta_x)C$ solid solution carbides exhibited high densities, excellent hardness and fracture toughness (ρ: 98.7-100.0 %, HVN: 19.69– 19.98 GPa, K_{IC}: 5.09-5.15 MPa $m^{1/2}$) compared with previously reported HfC and HfC−TaC solid solution carbides.

Keywords

A. Powders: solid state reaction; A. Sintering; D. Carbides; Solid solution

1. INTRODUCTION