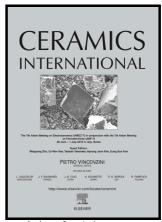
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Synthesis and properties of (Hf_{1-x}Ta_x)C solid solution carbides

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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 (p: 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

1

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