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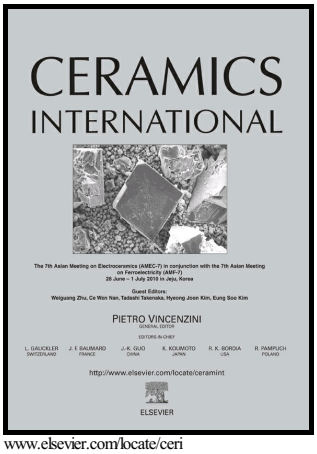

www.elsevier.com/locate/ceri

PII: S0272-8842(17)32939-5
DOI: https://doi.org/10.1016/j.ceramint.2017.12.229
Reference: CERI17109

To appear in: *Ceramics International*

Received date: 2 September 2017
Revised date: 13 December 2017
Accepted date: 29 December 2017

Cite this article as: D. Sanjay Kumar, K. Ananthasivan, Abhiram Senapati, S. Amirthapandian and Arup Dasgupta, Nitrate fusion synthesis and two-step sintering of nanocrystalline yttria stabilized hafnia powders, *Ceramics International,* https://doi.org/10.1016/j.ceramint.2017.12.229

Nitrate fusion synthesis and two-step sintering of nanocrystalline yttria stabilized hafnia powders

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Abstract

Bulk quantities of nanocrystalline yttria stabilized hafnia (YSH) powders with crystallite size ranging from 8 to 15 nm were successfully prepared for the first time through nitrate fusion synthesis at a temperature as low as 673 K. The yttrium content was varied from 6 to 30 mol %. The dependence of the properties of the final product on the quantity of the dopant was investigated. Microstructural investigations were carried out with scanning electron microscopy and transmission electron microscopy. A maximum relative sintered density of 98.2 ± 0.3 % T.D (theoretical density) was obtained for YSH containing 10 mol% yttrium by using "two-step sintering" at a final temperature of 1773 K. Anisotropic shrinkage factor (0.70 to 0.95) was found to vary linearly with the compaction pressure. SEM investigations reaffirmed that the sintered pellets comprised uniform distribution of faceted grains and elemental mapping revealed that yttrium is distributed uniformly in these sintered YSH monoliths.

Key words: nanocrystalline powders, yttria stabilized hafnia (YSH), nitrate fusion synthesis, two-step sintering, anisotropic shrinkage, crucible

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