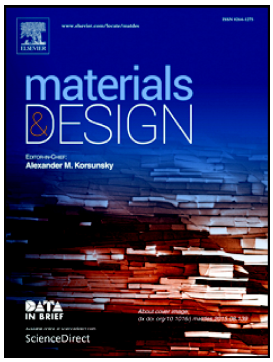

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PII: S0264-1275(18)30338-1
DOI: doi:10.1016/j.matdes.2018.04.060
Reference: JMADE 3873

To appear in: *Materials & Design*

Received date: 6 March 2018
Revised date: 23 April 2018
Accepted date: 24 April 2018

Please cite this article as: Hussam Alghamdi, Akash Dakhane, Absar Alum, Morteza Abbaszadegan, Barzin Mobasher, Narayanan Neithalath , Synthesis and characterization of economical, multi-functional porous ceramics based on abundant aluminosilicates. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jmade(2017), doi:10.1016/j.matdes.2018.04.060

Synthesis and Characterization of Economical, Multi-functional Porous Ceramics based on Abundant Aluminosilicates

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Abstract

This paper reports synthesis routes and microstructural and performance characterization of a family of economical, multifunctional porous ceramics developed through geopolymerization of an abundant volcanic tuff (aluminosilicate mineral) as the primary source material. Metakaolin, silica fume, alumina powder, and pure silicon powder are also used as additional ingredients when necessary, and activated by potassium-based alkaline agents. The composition and heat treatment regimes are modified to provide the desired pore structure features for percolation, contaminant retention, and thermal conductivity. The treatment temperatures used are lower than those used in conventional porous ceramics synthesis. Extensive microstructural characterization using different techniques to examine the morphology and to quantify the pore volumes, sizes, and connectivity, which are important in dictating the performance characteristics, are reported. Measurements of flow rates and thermal conductivity demonstrate the multifunctionality of the synthesized matrices, which demonstrate adequate strengths for a number of buildings-related applications.

Keywords: Aluminosilicate; Geopolymer; Porous ceramics; Pore structure; Thermal conductivity; Permeability

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