

Author's Accepted Manuscript

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www.elsevier.com/locate/ceri

PII: S0272-8842(15)02453-0
DOI: <http://dx.doi.org/10.1016/j.ceramint.2015.12.155>
Reference: CERII1950

To appear in: *Ceramics International*

Received date: 1 October 2015
Revised date: 17 December 2015
Accepted date: 26 December 2015

Cite this article as: S. Mukhopadhyay, K. Dana, S. Moitra, S. BasuMallick and T.K. Mukhopadhyay, Thermal and thermomechanical characteristics of monolithic refractory composite matrix containing surface-modified graphite *Ceramics International*, <http://dx.doi.org/10.1016/j.ceramint.2015.12.155>

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Thermal and thermomechanical characteristics of monolithic refractory composite matrix containing surface-modified graphite

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Abstract

The thermomechanical analysis (TMA) and thermal characteristics of carbon-containing refractory castable matrix with 20.0 wt% of graphite have been compared with graphite-free high alumina based similar castable matrix. Graphite has been added both in uncoated and coated forms, the latter having a thin sol-gel calcium aluminate coating on as-received graphite flakes. The influence of systematic variation of microfine constituents e.g. reactive alumina, high alumina cement etc in the matrix has been investigated in terms of the heat flow studies obtained by differential scanning calorimetry (DSC) and thermogravimetry analysis (TGA). The densification behavior of graphite-free and graphite-containing castable matrices has been critically estimated by the dimensional changes in dynamic heating regime up to 1500 °C. The role of coated graphite on improved densification behavior of refractory was explored by microstructure and phase assemblage studies of the respective fired castable. It was further corroborated by the transmission electron microscope (TEM) studies of surface-modified graphites.

Keywords :A. Sintering ; B. Electron Microscopy ; C. Thermomechanical Analysis, D. Al₂O₃ , Carbon .

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