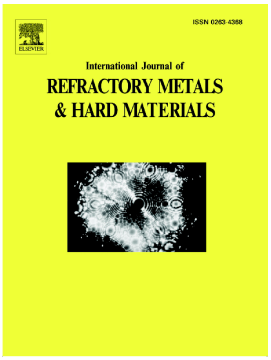

Investigation of the effect of Al2O3–Y2O3–CaO (AYC) additives on sinterability, microstructure and mechanical properties of SiC matrix composites: A review

Mahdi Khodaei, Omid Yaghobizadeh, Alireza Alipour Shahraki, Sadeq Esmaeeli

PII: S0263-4368(18)30449-9
DOI: doi:10.1016/j.ijrmhm.2018.08.008
Reference: RMHM 4774

To appear in: *International Journal of Refractory Metals and Hard Materials*

Received date: 9 July 2018
Revised date: 13 August 2018
Accepted date: 18 August 2018

Please cite this article as: Mahdi Khodaei, Omid Yaghobizadeh, Alireza Alipour Shahraki, Sadeq Esmaeeli , Investigation of the effect of Al2O3–Y2O3–CaO (AYC) additives on sinterability, microstructure and mechanical properties of SiC matrix composites: A review. Rmhm (2018), doi:10.1016/j.ijrmhm.2018.08.008

Investigation of the effect of Al_2O_3–Y_2O_3–CaO (AYC) additives on sinterability, microstructure and mechanical properties of SiC matrix composites: A Review

Mahdi Khodaei[a, 1], Omid Yaghobizadeh[b], Alireza Alipour Shahraki[a], Sadeq Esmaeeli[c]

[a] Composite Materials & Technology Center, Malek Ashtar University of Technology , Tehran, Iran.
[b] Department of Materials Engineering, Imam Khomeini International University (IKIU), Qazvin, Iran.
[c] Department of Ceramic, Shahreza Branch, Islamic Azad University, Shahreza, Iran.

Abstract:

Appropriate properties of SiC ceramic such as high hardness, low density, high melting point and high elastic modulus make this material as a favorite candidate for different industrial applications. Although some disadvantages including high sintering temperature, low sinterability, and low fracture toughness have restricted the use of this material, previous studies showed that using Al_2O_3-Y_2O_3 additives plays an effective role in the improvement of sinterability as well as the enhancement of the properties of these composites. Moreover, the addition of CaO results in the acceleration of the formation of molten phase and the improvement of sinterability. In addition, the use of these additives cause the formation of the intermetallic phases of $Al_5Y_3O_{12}$ (YAG) and CaY_2O_4 and by activating the mechanisms of crack deflection, crack bridging, phase transformation, strengthening the grain boundary and changing the fracture mode from intergranular to transgranular results in improved mechanical properties. This paper attempts to investigate the effect of using Al_2O_3–Y_2O_3–CaO (AYC) additives on sinterability, microstructure, and mechanical properties of SiC matrix composites including the composites reinforced with SiC fibers and SiC matrix nano-composites. Finally, the effect of the post-sintering annealing process under two conditions i.e., with and without applying pressure (pressureless sintering) on microstructure and mechanical properties has been studied.

Keywords: SiC-Al_2O_3–Y_2O_3–CaO; Fracture toughness; Flexural strength; Hardness; Microstructure; Crack bridging; Crack deflection.

1. Introduction

Silicon carbide has been widely studied over the past few years and is a promising material for high-temperature engineering applications because of its favorable properties such as high elastic

[1] Corresponding author,
E-mail address: mahdi.khodaei01@gmail.com