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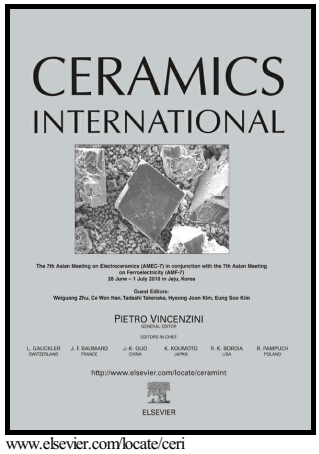

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Densification behavior of mullite-Al_2TiO_5 composites by reaction sintering of natural andalusite and TiO_2

Liusheng Li[a,b], Qingfeng Wang[b], Guihua Liao[b,*], Kunpeng Li[c], Guotian Ye[c]

[a] The State Key Laboratory of Refractories and Metallurgy, Wuhan University of Science and Technology, Wuhan 430081, China

[b] Henan Provincial Key Laboratory of Special Protective Materials, **School of Materials Science and Engineering,** Luoyang Institute of Science and Technology, Luoyang 471023, China

[c] **Henan Key Laboratory of High Temperature Functional Ceramics**, School of Materials Science and Engineering, Zhengzhou University, Zhengzhou 450001, China

Abstract:

In this work, mullite-Al_2TiO_5 composites were fabricated by natural andalusite with TiO_2 as an additive. The densification characteristic, phase composition and mullitization process of andalusite with TiO_2 addition was investigated by the Archimedes' principle, dilatometry, X-ray diffraction and scanning electron microscopy (SEM-EDS) techniques. The results showed that the incorporation of TiO_2 not only enhanced the thermal stability of in-situ Al_2TiO_5 in the silica liquid yielded from the mullitization of andalusite, but also accelerated andalusite decomposition and retarded mullite formation, which facilitated the sintering and densification of mullite-Al_2TiO_5 composites.

Keywords: Andalusite, Al_2TiO_5, Mullite, Densification, Sintering

1. Introduction

Aluminum titanate (AT), Al_2TiO_5, has been recognized as an excellent candidate material for refractory and engineering ceramics in the high temperature industries due to its low thermal expansion coefficient, low thermal conductivity, high melting point and low Young's modulus[1]. Moreover, its excellent thermal shock resistance, good corrosion resistance and alkali resistance properties are also good potential for diesel particulate filter and molten metal filtrations[2]. However, the practical applications of AT have been severely restricted, because of the low mechanical strength due to the micro-cracks induced by high anisotropy of the thermal expansion coefficients and the poor thermal stability associated with the phase decomposition into α-Al_2O_3