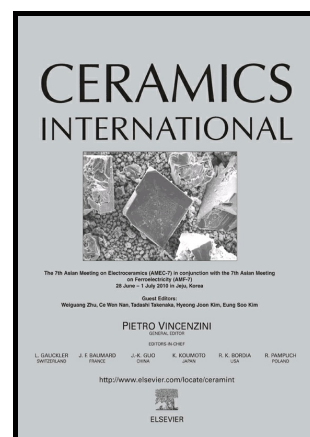


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Densification behavior of mullite- $\text{Al}_2\text{TiO}_5$  composites by reaction sintering of natural andalusite and  $\text{TiO}_2$

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**Abstract:**

In this work, mullite- $\text{Al}_2\text{TiO}_5$  composites were fabricated by natural andalusite with  $\text{TiO}_2$  as an additive. The densification characteristic, phase composition and mullitization process of andalusite with  $\text{TiO}_2$  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  $\text{TiO}_2$  not only enhanced the thermal stability of in-situ  $\text{Al}_2\text{TiO}_5$  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- $\text{Al}_2\text{TiO}_5$  composites.

**Keywords:** Andalusite,  $\text{Al}_2\text{TiO}_5$ , Mullite, Densification, Sintering

1. Introduction

Aluminum titanate (AT),  $\text{Al}_2\text{TiO}_5$ , 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  $\alpha\text{-Al}_2\text{O}_3$

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