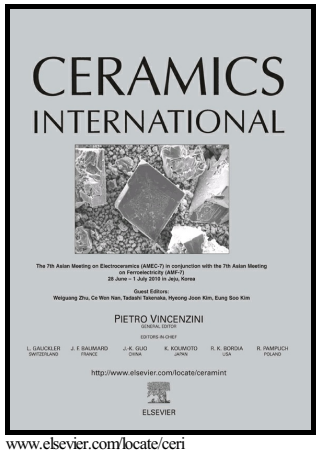

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Flexural Strength Evaluations and Fractography Analyses of Slip Cast Mesoporous Submicron Alumina

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Abstract

Mesoporous submicron α–Al_2O_3 green compacts were fabricated using slip casting of ultrafine alumina powders. The pre-sintered samples were sintered in air atmosphere at 1300 °C, 1350 °C, 1400 °C, and 1500 °C to obtain a variety of grain morphologies namely submicron equiaxed and micro rod structures. The resulting grain diameters lie between ~270 nm and ~1590 nm and total porosity fraction between 0.05 % and 13 %. The room temperature flexural strength (σ) evaluations and fractography analyses of sintered alumina samples were performed. It was observed that the total porosity fraction dictates the flexural strength as compared to grain diameter. Further, it was found that the flexural strength exhibited a decreasing trend for an increase in the total porosity fraction, and proved to be a better effective parameter than open porosity fraction. The fractography analyses suggest that samples sintered at 1300 °C and 1350 °C predominantly underwent intergranular fracture, while those sintered at 1400 °C and 1500 °C underwent a mixture of intergranular and transgranular fracture.

Keywords: Flexural strength; Mesoporous alumina; Submicron; Transgranular fracture; Intergranular fracture; Slip casting

1. Introduction

Alumina (Al_2O_3) is one of the most widely used and a well-studied advanced ceramic. The high temperature and high chemical stability of Al_2O_3 as well as its strength retention at elevated temperatures makes it an interesting material for many applications [1,2]. Porous ceramics offer high surface area to volume ratio and are potentially interesting as catalyst carriers or filters for

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