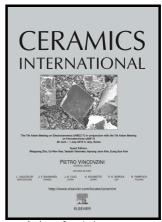
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Flexural Strength Evaluations and Fractography Analyses of Slip Cast Mesoporous

Submicron Alumina

Sriharitha Rowthu^{1,*}, Fatemeh Saeidi¹, Kilian Wasmer¹, Patrik Hoffmann¹, Jakob Kuebler²

¹Laboratory for Advanced Materials Processing, Empa, Swiss Federal Laboratories for Materials Science and

Technology, Feuerwerkerstrasse 39, CH-3602 Thun, Switzerland

²Laboratory for High Performance Ceramics, Empa, Swiss Federal Laboratories for Materials Science and

Technology, Ueberlandstrasse 129, CH-8600 Duebendorf, Switzerland

*Corresponding author: haritha.iitm@gmail.com; sriharitha.rowthu@psi.ch

Abstract

Mesoporous submicron α-Al₂O₃ 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 (Al₂O₃) is one of the most widely used and a well-studied advanced ceramic. The high

temperature and high chemical stability of Al₂O₃ 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

*Currently at Laboratory for Nuclear Materials (LNM), Paul Scherrer Institute (PSI), CH-5232, Villigen, Switzerland. Email Id: sriharitha.rowthu@psi.ch

1

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