

# Accepted Manuscript

Microstructure and properties of alumina ceramics prepared from submicrometer alumina powder with MgO–ZrO<sub>2</sub> coated on alumina grain surface

Xiangming Li, Mingjun Gao, Liang Zhang



PII: S0925-8388(16)30259-6

DOI: [10.1016/j.jallcom.2016.01.254](https://doi.org/10.1016/j.jallcom.2016.01.254)

Reference: JALCOM 36605

To appear in: *Journal of Alloys and Compounds*

Received Date: 27 December 2015

Revised Date: 29 January 2016

Accepted Date: 30 January 2016

Please cite this article as: X. Li, M. Gao, L. Zhang, Microstructure and properties of alumina ceramics prepared from submicrometer alumina powder with MgO–ZrO<sub>2</sub> coated on alumina grain surface, *Journal of Alloys and Compounds* (2016), doi: 10.1016/j.jallcom.2016.01.254.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# Microstructure and properties of alumina ceramics prepared from submicrometer alumina powder with MgO–ZrO<sub>2</sub> coated on alumina grain surface

Xiangming Li <sup>a,\*</sup>, Mingjun Gao <sup>a</sup>, Liang Zhang <sup>b</sup>

<sup>a</sup>*School of Environment and Materials Engineering, Yantai University, Yantai Shandong 264005, PR China*

<sup>b</sup>*Sports Medicine Department of Honghui Hospital, Xi'an Jiaotong University Medicine College, Xi'an Shaanxi 710054, PR China*

## Abstract

For preparing alumina ceramic prosthetic implants with dense microstructure and good mechanical properties, a combined technique of ball-milling, air-blowing, chemical precipitation and calcinations was explored and used to prepare submicrometer alumina powder with MgO–ZrO<sub>2</sub> coated on alumina grain surface, and then alumina ceramics were prepared by sintering alumina green bodies made by cold isostatic pressing. Because of the well distribution of ZrO<sub>2</sub> on the surface of alumina grains, the alumina ceramics obtain dense microstructure and excellent mechanical properties. With the increase of molar ratio between ZrO<sub>2</sub> and alumina powder in raw material from 0.02 to 0.08, the alumina ceramics get almost fully dense microstructure and its flexural strength increases from 589 to 637 MPa, its fracture toughness increases from 5.62 to 6.16 MPa·m<sup>1/2</sup> and its Vickers hardness increases from 17.3 to 17.7 GPa. The alumina ceramics prepared in this work are promising prosthetic implants materials with excellent mechanical properties.

**Keywords:** Alumina; Zirconia; Chemical precipitation; Microstructure; Mechanical properties

## 1. Introduction

In the past three decades, alumina ceramics have been used as an ideal bearing surface for prosthetic implants especially for total hip arthroplasty (THA) owing to their inert, hard, and hydrophilic properties [1]. In THA, the wear advantages and little deterioration of mechanical properties of alumina ceramic

---

\* Corresponding author Tel.: +86-0535-6706038; fax: +86-0535-6706038.

E-mail address: li\_xiangming@yahoo.com (X. Li)

Download English Version:

<https://daneshyari.com/en/article/1606358>

Download Persian Version:

<https://daneshyari.com/article/1606358>

[Daneshyari.com](https://daneshyari.com)