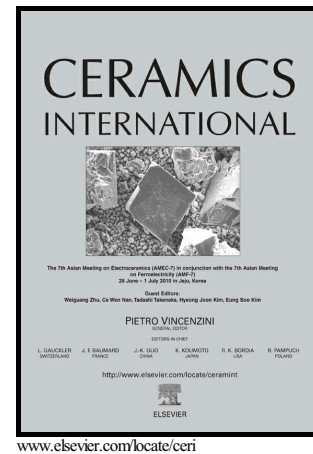


Ultrasonic Vibration-Assisted Laser Engineering
Net Shaping of $\text{ZrO}_2\text{-Al}_2\text{O}_3$ Bulk Parts: Effects on
Crack Suppression, Microstructure, and
Mechanical Properties

Yingbin Hu, Fuda Ning, Weilong Cong, Yuanchen
Li, Xinlin Wang, Hui Wang



PII: S0272-8842(17)32457-4
DOI: <https://doi.org/10.1016/j.ceramint.2017.11.013>
Reference: CERI16668

To appear in: *Ceramics International*

Received date: 21 August 2017
Revised date: 25 October 2017
Accepted date: 3 November 2017

Cite this article as: Yingbin Hu, Fuda Ning, Weilong Cong, Yuanchen Li, Xinlin Wang and Hui Wang, Ultrasonic Vibration-Assisted Laser Engineering Net Shaping of $\text{ZrO}_2\text{-Al}_2\text{O}_3$ Bulk Parts: Effects on Crack Suppression, Microstructure, and Mechanical Properties, *Ceramics International*, <https://doi.org/10.1016/j.ceramint.2017.11.013>

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 galley proof before it is published in its final citable 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.

Ultrasonic Vibration-Assisted Laser Engineering Net Shaping of ZrO_2 - Al_2O_3 Bulk Parts: Effects on Crack Suppression, Microstructure, and Mechanical Properties

Yingbin Hu^a, Fuda Ning^a, Weilong Cong^{a*}, Yuanchen Li^{a,b}, Xinlin Wang^{a,c}, Hui Wang^a

^a*Department of Industrial, Manufacturing, & Systems Engineering, Texas Tech University, Lubbock, Texas, 79409, US*

^b*Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, Tianjin, 300072, China*

^c*School of Mechanical Engineering, Dalian University of Technology, Dalian, Liaoning, 116024, China*

*Corresponding author at: Department of Industrial, Manufacturing, & Systems Engineering, Texas Tech University, Lubbock, TX 79409-3061, USA. Phone: 8067423543. Fax: 8067423411

Email address: weilong.cong@ttu.edu

Abstract

Laser additive manufactured zirconia-alumina ceramic (ZrO_2 - Al_2O_3) parts demonstrate severe problems resulting from cracking and inhomogeneous material dispersion. To reduce these problems, we propose a novel ultrasonic vibration-assisted laser engineered net shaping (LENS) process for fabrication of bulk ZrO_2 - Al_2O_3 parts. Results showed that the initiation of cracks and the crack propagation were suppressed in the parts fabricated by LENS process with ultrasonic vibration. For the parts fabricated without ultrasonic vibration, the sizes of cracks decreased with the increase of laser power. Scanning electron microscope analyses proved that the introduction of ultrasonic vibration was beneficial for grain refinement and uniform material dispersion. Due to the suppressed cracking, refined grains, and homogenized material dispersion, the parts fabricated with ultrasonic vibration demonstrated better mechanical properties (including higher microhardness, higher wear resistance, and better compressive properties), compared with the parts fabricated without

Download English Version:

<https://daneshyari.com/en/article/7888444>

Download Persian Version:

<https://daneshyari.com/article/7888444>

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