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Authors: Basem M.A. Abdo, Saqib Anwar, Abdualziz M. El-Tamimi, Abdulrahman M. Alahmari, Emad Abouel Nasr



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## Laser micro-milling of bio-lox forte ceramic: an experimental analysis

Basem M. A. Abdo<sup>1,2\*</sup>, Saqib Anwar<sup>1</sup>, Abdualziz M. El-Tamimi<sup>1</sup>, Abdulrahman M. Alahmari<sup>1,2</sup>, Emad Abouel Nasr<sup>1,3</sup>

basimksu@gmail.com; sanwar@ksu.edu.sa; atamimi@ksu.edu.sa; alahmari@ksu.edu.sa; eabdelghany@ksu.edu.sa

<sup>1</sup>Industrial Engineering Department, College of Engineering, King Saud University, Riyadh 12372, Saudi Arabia.

<sup>2</sup>Princess Fatima Alnijiris's Research Chair for Advanced Manufacturing Technology (FARCAMT Chair), Advanced Manufacturing Institute, King Saud University, Riyadh – Saudi Arabia.

<sup>3</sup>Mechanical Engineering Department, Faculty of Engineering, Helwan University, Cairo, Egypt

### Highlights

- This research investigates the Nd:YAG pulsed laser micro-channeling process on bio-lox forte materials.
- The influence of process parameters on micro-channels geometries, MRR, surface roughness and morphology was assessed.
- Micro-channels with a minimum surface roughness of 1.81  $\mu\text{m}$  and a average dimensional error of  $< 10\%$  can be fabricated
- Better surface smoothness with no elemental/phase changes of the fabricated micro-channels can be achieved

### Abstract

Laser micro-milling process (LMMP) is one of the competent machining processes to fabricate micro-features in a wide range of materials. This paper presents the results of an investigation on the process capability of Nd:YAG laser to produce micro-channels on bio-lox forte material that has numerous applications in the medical field. The main objective of the current study is to produce the micro-channels in the bio-lox forte material with the desired/target geometry and acceptable surface quality. Preliminary experiments were conducted to select the appropriate ranges of the key input laser process parameters including laser scanning speed (100 – 500 mm/s), pulse frequency (5–25 kHz), laser intensity (86 – 96 %), scanning strategies (line, net and cross) and track displacement (5–20 $\mu\text{m}$ ). The effects of the selected process parameters on the quality of the micro-channel' were evaluated by analyzing the dimensional accuracy, material removal rate, surface roughness and surface morphology. The experimental results reveal that the often

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