

## Accepted Manuscript

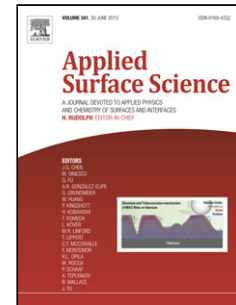
Title: Control of the kerf size and microstructure in Inconel 738 superalloy by femtosecond laser beam cutting

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## Control of the kerf size and microstructure in Inconel 738 superalloy by femtosecond laser beam cutting

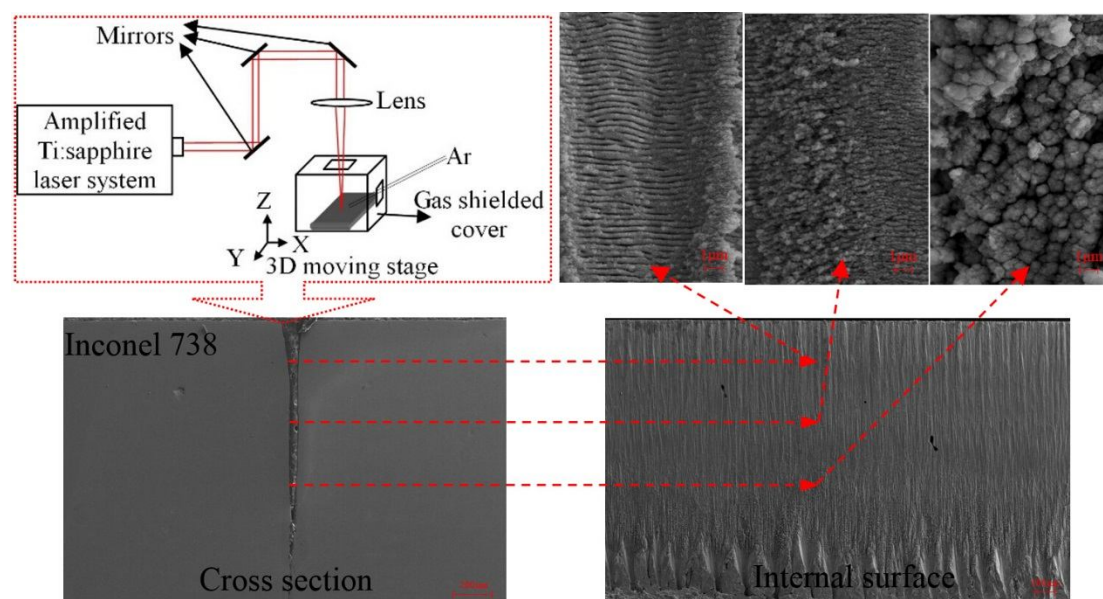
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### Graphical Abstract

Microstructure morphology in the Inconel 738 kerf by femtosecond laser beam cutting



### Highlights

- Effects of processing parameters on the kerf size in Inconel 738 are investigated.
- Defocus is a key parameter affecting the kerf width due to the intensity clamping.
- The internal surface microstructures with different scanning speed are presented.
- The material removal mechanism contains normal vaporization and phase explosion.
- Oxidation mechanism is attributed to the trapping effect of the dangling bonds.

### Abstract

Femtosecond laser beam cutting is becoming widely used to meet demands for increasing accuracy in micro-machining. In this paper, the effects of processing parameters in femtosecond laser beam cutting on the kerf size and microstructure in Inconel 738 have been investigated. The defocus, pulse width and scanning speed were selected to study the controllability of the cutting process. Adjusting and matching the processing parameters was a basic enhancement method to acquire well defined kerf size and the high-quality ablation of microstructures, which has

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