Journal of
Electrical Engineering and Electronic Technology

Abstract

Direct fabrication of fluctuated walls in ceramic tubes by lithographic additive manufacturing

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Abstract:

Ultraviolet laser lithography was newly developed as a direct forming process of fine ceramic components with micro geometric patterns. As additive manufacturing techniques, two dimensional cross sections were created through dewaxing and sintering by UV laser drawing on spread resin paste including ceramic nanoparticles, and three dimensional composite models were sterically printed by layer laminations and interlayer joining. Alumina particles of 300 nm in average diameter were dispersed in to photo sensitive liquid resins at 50 % in volume fraction. The resin paste was spread on a glass substrate at 50 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted at 10 μm in diameter and scanned on the surface. Irradiation power was increased to 1.0 W for enough solidification depth. The half wavelength of the incident ultraviolet ray should be comparable with the nanoparticles gaps in the resin paste, and electromagnetic field can be resonated and concentrated through Anderson localization. In this investigation, through computer aided smart manufacturing, design and evaluation (Smart MADE), fluctuated patterns were introduced into inner walls of micro tubes to modulate liquid and gaseous flows effectively.

Biography:

Soshu Kirihara is a doctor of engineering and a professor of Joining and Welding Research Institute (JWRI), Osaka University, Japan. In his main investigation “Materials Tectonics” for environmental improvements of “Geotechnology”, multi-dimensional structures were successfully fabricated to modulate energy and materials flows effectively. Ceramic and metal components were fabricated directly by smart additive manufacturing, design and evaluation (Smart MADE) using high power ultraviolet laser lithography. Original stereolithography systems were developed, and new start-up company “SK-Fine” was established through academic-industrial collaboration.

Recent Publications:

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4th International Microfluidics Congress; March 25-26, 2020; Las Vegas, USA

Citation: Soshu Kirihara; Direct fabrication of fluctuated walls in ceramic tubes by lithographic additive manufacturing; Microfluidics 2020; March 25-26, 2020; Las Vegas, USA