Soshu Kirihara, J Material Sci Eng 2019, Volume 8
DOI: 10.4172/2169-0022-C2-127

3rd International Conference on

3D Printing Technology and Innovations

March 25-26, 2019 | Rome, Italy

Soshu Kirihara

Osaka University, Japan

Stereolithographic additive manufacturing of ceramic components

Stereolithographic additive manufacturing (STL-AM) of lamination shaping can fabricate solid components according to topological geometry. Two dimensional (2D) cross sectional patterns were created through photo polymerization by ultra violet laser drawing on spread resin paste including ceramic nanoparticles, and three dimensional (3D) composite models were sterically printed by layer lamination though chemical bonding. An automatic collimeter was equipped with the laser scanner to adjust beam diameter. Fine or coarse beams could realize high resolution or wide area drawings, respectively. As row material of the 3D printing, nanometer sized metal or ceramic particles were dispersed in to photo sensitive liquid resins from 40 to 60% in volume fraction. The resin paste was spread on a glass substrate at 10 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted from 10 to 300 μm in variable diameter and scanned on the pasted resin surface. Irradiation power was changed automatically from 10 to 200 mW for enough solidification depth for 2D layer bonding. The created 3D composite precursor was dewaxed and sintered in the vacuum and air atmosphere to obtain full metal and ceramic components. Through the computer aided design, manufacture and evaluation (CAD/CAM/CAE), geometrically modulated periodic and self-similar patterns with graded and fluctuated structures were processed. Porous electrode of yttria stabilized zirconia for solid oxide fuel cell, alumina photonic crystals to control electromagnetic waves and artificial bones of calcium phosphate scaffolds were created successfully.

Recent Publications

1. Soshu Kirihara (2016) Stereolithographic additive manufacturing of ceramic components by using nanoparticle paste feeding. Materials Science Forum, 879:2485-2488.
2. Soshu Kirihara (2015) Stereolithography of ceramic components: fabrication of photonic crystals with diamond structures for terahertz wave modulation. Journal of the Ceramic Society of Japan 123(9):816-822.
3. Soshu Kirihara and Maasa Nakano (2015) Freeform fabrication of magnetophotonic crystals with diamond lattices of oxide and metallic glasses for terahertz wave control by micro patterning stereolithography and low temperature sintering. Micromachines 4(2):149-156.

Biography

Soshu Kirihara is a Professor of Joining and Welding Research Institute (JWRI), Osaka University, Japan. In his main investigation “Materials Tectonics”, geometric structures were successfully fabricated to modulate energy and materials flows effectively. Original stereolithography systems were developed, and new start-up company “SK-Fine” was established through academic-industrial collaboration.

kirihara@jwri.osaka-u.ac.jp