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Research progress in additive manufacturing of ceramics and some related applications

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Compared with traditional methods, additive manufacturing (AM) technology has shown great advantages in preparing high-performance polymer and metal parts with complex shape. However, it is difficult to prepare high-performance ceramic parts with complex shape by AM technology. So far, Prof. Shi Yu Sheng's group in Huazhong University of Science and Technology has done many researches on the preparation of various ceramic materials via Selective Laser Sintering (SLS) and Stereo Lithography Apparatus (SLA). Regarding SLS, three methods, namely mechanical mixing, solvent evaporation and dissolution-precipitation, were used to prepare ceramic-polymer composite powders with good fluidity. Subsequently, porous cordierite, kaolin and Si3N4 ceramic parts with high porosity were prepared by SLS. To acquire dense ceramic parts, Cold Isostatic Pressing (CIP) process was used to densify the SLS green parts, and $Al2O_3$, ZrO_2 and SiC ceramic parts with high density and complex shape were successfully prepared by the SLS/CIP hybrid technology. In the recent research of Prof. Shi's group, dense $Al2O_3$ and ZrO_2 ceramic parts with high density and high precision were prepared by Stereo Lithography Apparatus (SLA), in which the raw materials and AM equipment were all developed independently by Prof. Shi's group. Based on above researches, the SLS and SLA technologies were used to prepare high-performance ceramic parts in the application of ceramic dental restoration, honeycomb ceramics, etc.

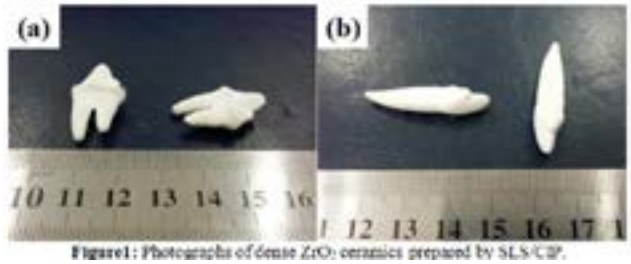

Figure1: Photographs of dense ZrO_2 ceramics prepared by SLS/CIP.

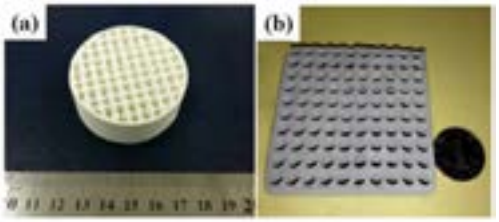

Figure2: Photographs of porous ceramics prepared by SLS: (a) kaolin and (b) Si_3N_4.

Biography

Jia Min Wu has completed his PhD from Huazhong University of Science and Technology, China. He has been In Charge of more than 10 research projects in China. So far, he has published more than 30 academic papers in *Journal of the European Ceramic Society, Journal of the American Ceramic Society* and other top journals on ceramic materials. Meanwhile, he has applied for more than 20 patents in China. In addition, he has also acted as Reviewer for many ceramic related repute journals, and he has been invited to give speeches in several international conferences on additive manufactruing of ceramics. His research interest includes: additive manufacturing of ceramics and related application.

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