

Energy-Efficient Ultra-Fast Spark Plasma Sintering of Binder Jetting 3D-Printed 316L Stainless Steel

Tuesday, 1 September 2026 16:40 (20 minutes)

This work presents an energy-efficient and ultra-fast sintering strategy (EU-SPS) based on a pressure-less ultra-fast sintering (PLUFS) approach implemented within a spark plasma sintering (SPS) apparatus. The proposed method enables rapid densification of binder-jetted components without the need for a separate debinding step. By integrating the ultra-rapid thermal capabilities of ultra-fast sintering with targeted modifications to the conventional SPS configuration, EU-SPS is designed to process fragile binder-jetted parts while mitigating common metallurgical issues such as carbon contamination and residual δ -ferrite. Finite element method (FEM) modeling grounded in continuum sintering theory was employed to investigate densification kinetics and grain growth during EU-SPS. In addition, a linearized perturbation analysis based on continuum constitutive parameters was used to assess sintering instability and densification inhomogeneity arising from the high heating rates and large thermal gradients intrinsic to the process. Complementary metallurgical characterization was conducted to elucidate the mechanisms governing microstructural optimization in binder-jetted 316L stainless steel. Overall, this work establishes a viable pathway for the rapid post-processing of additively manufactured metals and supports the industrial adoption of binder jetting as a scalable and reliable manufacturing technology.

Professional Status of the Speaker

Senior Scientist

Interest in submitting a paper in a special issue of

Journal of the European Ceramic Society (Elsevier)

Invitation letter for visa

No

Author: Dr JIANG, Runjian (San Diego State university)

Co-authors: Dr GRIPPI, Thomas (San Diego State university); TORRESANI, Elisa (San Diego State university); Prof. OLEVSKY, Eugene (San Diego State university)

Presenter: TORRESANI, Elisa (San Diego State university)

Session Classification: Flash Sintering

Track Classification: Group 3: Flash Sintering