

Influence of Deformation Speed on Final Density in Single-Discharge Sintering of Metallic Powders

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The effect of deformation speed on the final density of copper and iron parts consolidated by a single-discharge sintering method was investigated experimentally. During the short electro-thermo-mechanical consolidation, the displacement speed of the press axis was systematically varied while all other process parameters were held constant. Samples of different heights and projected areas were evaluated to assess geometric sensitivity.

The results reveal a clear non-linear dependence of final density on deformation speed. Contrary to conventional quasi-static powder compaction, where lower strain rates generally favor higher density, the present experiments show that neither the lowest nor the highest deformation speeds maximize density. Instead, an intermediate range of deformation rates produces superior consolidation.

These findings demonstrate that press-axis displacement speed acts as an independent governing process variable in single-discharge sintering, rather than merely a mechanical boundary condition. The observed behavior suggests the presence of competing rate-dependent phenomena during the short-duration consolidation event, including transient thermal evolution and rate-sensitive plastic response.

The results provide new experimental insight into the process window of rapid field-assisted powder consolidation and establish deformation speed as a critical parameter for future modeling and optimization.

Professional Status of the Speaker

Senior Scientist

Interest in submitting a paper in a special issue of

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Invitation letter for visa

No

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