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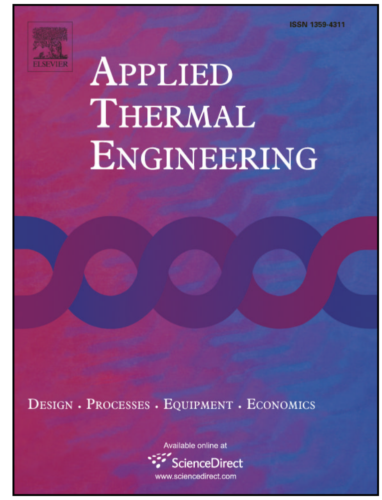

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Charles Manière, Tony Zahrah, Eugene A. Olevsky

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Fluid Dynamics Thermo-Mechanical Simulation of Sintering: Uniformity of Temperature and Density Distributions

Charles Manière[a], Tony Zahrah[b], Eugene A. Olevsky[a, c]*

(a) Powder Technology Laboratory, San Diego State University, San Diego, USA
(b) Matsys Inc., Sterling, USA
(c) NanoEngineering, University of California, San Diego, La Jolla, USA

Keywords

Sintering; simulation; computational fluid dynamics; densification; complex shape

Abstract

One of the main contemporary challenges of sintering simulations is taking into account all the coupled physics present in the sintering process. The model should predict the convection, surface to surface radiation, conduction, specimen sintering phenomena, and also the proportional integral derivative regulation. A fluid dynamics thermo-mechanical model (FDTM) is implemented to predict the degree of uniformity of heating and compaction of a large size gear shape specimens under various process conditions. The FDTM model is validated by a dilatometer test indicating a very good agreement with the experimental data. The complex shape sintering simulation shows that the temperature and densification gradients depend strongly on the sample thickness. A large volume of material can be easily heated if the specimen's shape allows the hot gas to male its way inside the sample volume. If this condition is not satisfied, it is shown that a large and closed volume of material can generate significant temperature and density gradients.

* Corresponding author: EO: Powder Technology Laboratory, San Diego State University, 5500 Campanile Drive, San Diego, CA 92182-1323,
Ph.: (619)-594-6329; Fax: (619)-594-3599, E-mail address: eolevsky@mail.sdsu.edu