

Sintering Simulation of Stainless Steel Powder Compacts

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Die compaction of powder metals is a classic discrete component fabrication process that relies on the re-arrangement, distortion, and flow of metal particles in a die cavity, where the powders are compressed into a preform that is subsequently sintered. The sintered material has competitive properties, but without the cost associated with additional machining. One of the technological challenges when fabricating parts via powder processing methods is the ability to achieve undistorted, full density parts. For example, density gradients induced from the press motions lead to nonuniform shrinkage during the thermal processing. This research presents a model that predicts the shrinkage during high temperature sintering for powder compacts that have density gradients. The one-dimensional diffusional flow model for pressureless sintering includes an Arrhenius-type viscosity model and allows for the inclusion of grain growth and thermal expansion as functions of temperature.

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