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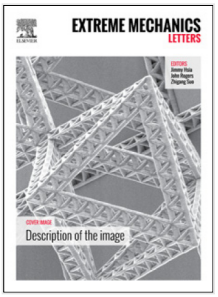

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A Study of the evolution of microstructure and consolidation kinetics during sintering using a phase field modeling based approach

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ABSTRACT

Sintering is a processing technique which compacts powder materials into solids leading to microstructural evolution with reduced surface area and improved material density. Understanding the densification mechanism and grain growth kinetics during the powder compaction process during sintering is of immense importance in order to evaluate usability of the final materials in a wide range of applications. Current work focuses on capturing the microstructural changes as powder particles compact into a polycrystalline structure during sintering. A phase field modeling based approach is adopted in this study in order to predict consolidation kinetics during sintering. It is observed that at the initial stage of sintering interactions between powder particles are initiated due to surface diffusion. At later stage, densification is primarily governed by volume and grain boundary diffusion. Also individual grains increase in size under pressure until adjacent grains touch each other. Once grains start interacting with adjacent grains, grain boundary diffuses and average grain size stabilizes.

Key Words: Sintering, Phase Field Modeling, Consolidation, Diffusion, Grain Growth