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**A Review of Methods to Model Microstructural Evolution During Sintering**

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Much progress has been made in simulation of microstructural evolution in powder particle compacts using a variety of models such as Potts kinetic Monte Carlo, phase-field and discrete element models. However, no model has been able to simulate detailed microstructural evolution of large number of particles sintering heterogeneously, so that differential or constraint sintering can be simulated during all stages of sintering. The Potts kinetic Monte Carlo model, which are energy minimization methods does not treat long range forces that form in powder compacts during differential sintering. Phase-field models, which are also energy minimization models, cannot simulate densification, only coarsening with no long-range forces. Discrete element methods treat each particle as a discrete element which overlap in volume to simulation densification and therefore do not simulate the grain shape or size evolution. In this presentation, the advantages and limitation of these models will be reviewed to motivate the need to develop new models to overcome these limitations. Several newer emerging methods that have the potential to simulate the complete microstructural evolution during sintering through all stages of sintering under differential stress states will be presented and discussed. In particular, peridynamic theory and its ability to model all the physics to simulate microstructure will be presented.

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