Graduate Student Research Seminar

Fall 2022

The role of local particle packing on interfacial kinetics during nanoscale sintering

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Monday, October 17th
3:00 pm (EST) – 132 Fluor Daniel Building

Abstract

Recent advances in sintering-based manufacturing have enabled the fabrication of hierarchical microstructures with intricate features. Examples include nanolattices, nanorods, and nanopores materials. Throughout the years, the goal of sintering has been to achieve a fully dense homogeneous microstructure. However, recent studies show that the microstructure's inhomogeneity and porosity have a double-edged-sword effect on the materials' properties. Despite its negative impact on fatigue strength and corrosion resistance, porous microstructures with a high surface-to-volume ratio are desired for electrochemical activity. Also, inhomogeneous structures are used in composites as they obtain a higher amount of deformation on the surface and a lower deformation degree in the center. In this context, microstructure inhomogeneity and porosity are not treated as undesired defects but instead features that can be tailored for specific applications. Herein, we present recent work to understand interfacial kinetic processes that govern microstructure formation and evolution during nanoscale sintering. Theoretical and phase field studies demonstrate the paramount role of local particle packing in coarsening and densification rates and interfacial instabilities during nanoscale sintering. Our work provides much-needed process-structure linkages related to the processing of heterostructured materials.

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