Materials Science & Engineering Doctoral Defense

Modeling, Characterizing and Reconstructing Mesoscale Microstructural Evolution in Particulate Processing and Solid-State Sintering

School for Engineering of Matter, Transport and Energy

Shaohua Chen
Advisor: Dr. Yang Jiao

abstract

We integrate a variety of simulation methods, such as finite element method (FEM), cellular automata (CA), kinetic Monte Carlo (kMC), stochastic reconstruction and Discrete Element Method (DEM), in order to devise an integrated computational material engineering (ICME) platform for modeling microstructure evolution in additive manufacturing. For example, we have investigated DEM simulation on hopper discharge, combined DEM, kMC and stochastic reconstruction to model the conventional sintering process, and integrated FEM and cellular automata to dynamically monitor selective laser sintering of titanium alloy. The results indicate that joining models from different scales is promising to provide us a complete and straightforward description of a physical process while guarantees accuracy. The ultimate goal of our work is to establish a united modeling streamline with various computational schemes being incorporated and working at different length and time scales for the purpose of a thorough understanding of the process under study.

April 3, 2018; 1:30 PM; ERC 490