

An Atomistic Study of Nanoscale Sintering: Application to Additive Manufacturing

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Solid-state sintering within direct ink write applications has become a key focus area for researchers in additive manufacturing seeking to understand processing of metallic and ceramic powders. In this study, atomistic simulations are leveraged to examine sintering dynamics of Nickel, where simple two and three particle geometries are used to examine the role of particle misorientation angles on grain boundary (GB) formation, rigid body rotations and pore shrinkage. For the two particle geometry, a wide range of misorientation angles and particle diameters are explored with the aim of examining their roles on GB formation and neck growth. For the three particle geometry, pore shrinkage and associated dynamical scaling are examined as a function of misorientation angle at a constant particle diameter of 10 nm. Simulation results highlight the role of GBs and their anisotropy on the sintering behavior.