Mesoscale Modeling of Cold Spray Multi-Particle Impact of Tantalum Powders

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Understanding the jetting and recrystallization behaviours in a practical cold spray process requires accurate expressions of the microstructure evolution during multi-particle impact. Quasi-coarse-grained dynamics (QCGD) provides such a capability to reveal the deformation behaviours at experimental time and length scales of cold spray. The QCGD simulations are carried out to study the multi-particle impact of 20 um Tantalum powders onto a Tantalum substrate. A detailed analysis of the evolution of pressure, temperature, and shear strain is conducted to investigate jet initiation at the particle-particle and particle-substrate interfaces. Grain size distributions for initial and final splat microstructure are also obtained using an atom orientation clustering technique to identify recrystallization. The presentation will discuss the mesoscale modeling using QCGD, the jet initialization, and recrystallization behaviours during the multi-particle impact of Tantalum powders.