**CSAT 2025 Poster Abstract**

**Observing High Strain-Rate Polymer Impact and Scaling Behavior to Inform Cold Spray Using Ultra High-Speed Videography**

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Current methods used to characterize high strain rate particle impacts relevant to cold spray processes are limited in resolving deformation characteristics and observing viscoelastic behavior of particles during deposition. These limitations create critical gaps in the understanding of particle-particle and particle-substrate interactions, adhesion mechanisms, and the optimization of deposition parameters. The primary objective of this research is to provide insight into high strain rate deformation behavior and viscoelastic properties of particles in cold spray-like impacts for the purposes of material vetting and optimization of spray parameters for deposition quality and efficiency. Ultra-high-speed video capture used in macro impact experiments has proven to be a useful tool for understanding deformation characteristics and observing viscoelastic properties that are not evident when examining post-impact particles. The presence of cold spray features and the ability to resolve viscoelastic behavior at the macro scale suggests that similar insight could be gained at cold spray scales with some variance due to scaling effects. Adapting the technique to observe viscoelastic behavior nearing cold spray scales informs experimentation beyond spray density and deposition efficiency traditionally used to qualify spray parameters. The presented approach works toward understanding cold spray adhesion and deposition mechanisms by observing single particle deformations at various scales with control over spray conditions beyond alternative imaging and ex-situ characterization methods. This results in actionable insights for improving material selection, process parameters, and deposition strategies across a wide range of cold spray applications while expanding on the capabilities of alternative cold spray characterization methods.