

Cold Spray for Additive Manufacturing

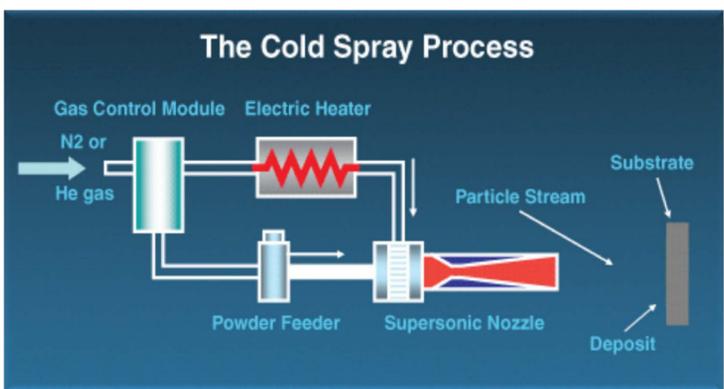


S&T Campaign: Materials Research
Manufacturing Science, Processing, & Sustainment

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Research Objective

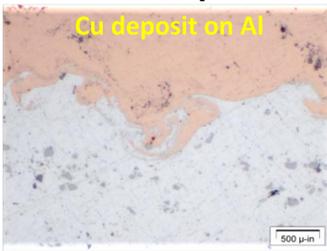
- To model, design, and develop cold spray as a qualified process for depositing coatings, low cost dimensional repair, and production of near-net shape parts in order to alleviate logistical burdens on high cost restoration, lack of viable repair processes, and long lead times for replacement of metal components



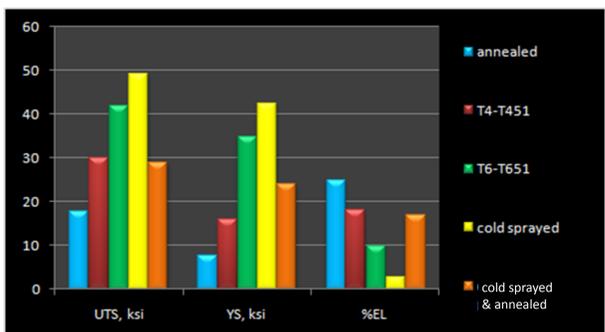
Cold spray is a unique solid-state materials consolidation process which utilizes high velocity particles impinging upon a substrate to build up coatings and/or near-net shaped parts without the use of combustion fuels

Challenges

- Address limitations in materials capabilities for additive manufacturing using the advantages of cold spray as a low temperature, powder-based process
 - Corrosion/thermally sensitive substrates and feedstocks are key cold spray applications
 - Multi-component deposits, functional grading



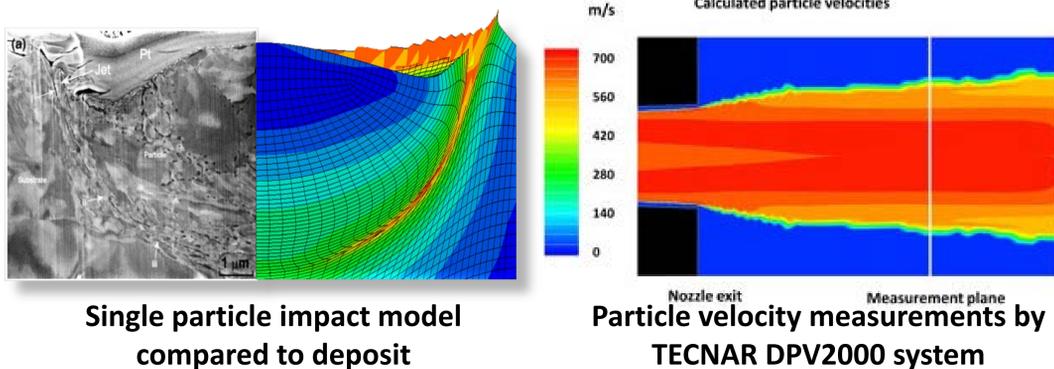
- Develop powder feedstock production processes and specifications tuned for cold spray process to further the mechanical capabilities of deposits
- Provide extensive materials characterization data to support qualification of repaired and near-net shape components



Mechanical properties of cold sprayed deposits

ARL Facilities and Capabilities Available to Support Collaborative Research

- Full suite of cold and thermal spray capabilities
 - Large-scale industrial spray systems for development of cutting edge research and applications
 - Portable spray systems to design and test repair in the field
- Extensive resources and tools for spray/impact modeling, process development, materials characterization, and mechanical testing
- Over 30 years of experience modifying cold spray systems and techniques to maximize the performance of additive manufactured parts



Single particle impact model compared to deposit

Particle velocity measurements by TECNAR DPV2000 system

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- Powder synthesis, processing, and characterization experimentation and expertise
- Modeling of multi-particle impact phenomena to predict and design material properties in deposits
- Sophisticated automation for cold spray processing



Cold Spray Repair of Magnesium Components: Main, Intermediate and Tail Gearboxes for UH-60