



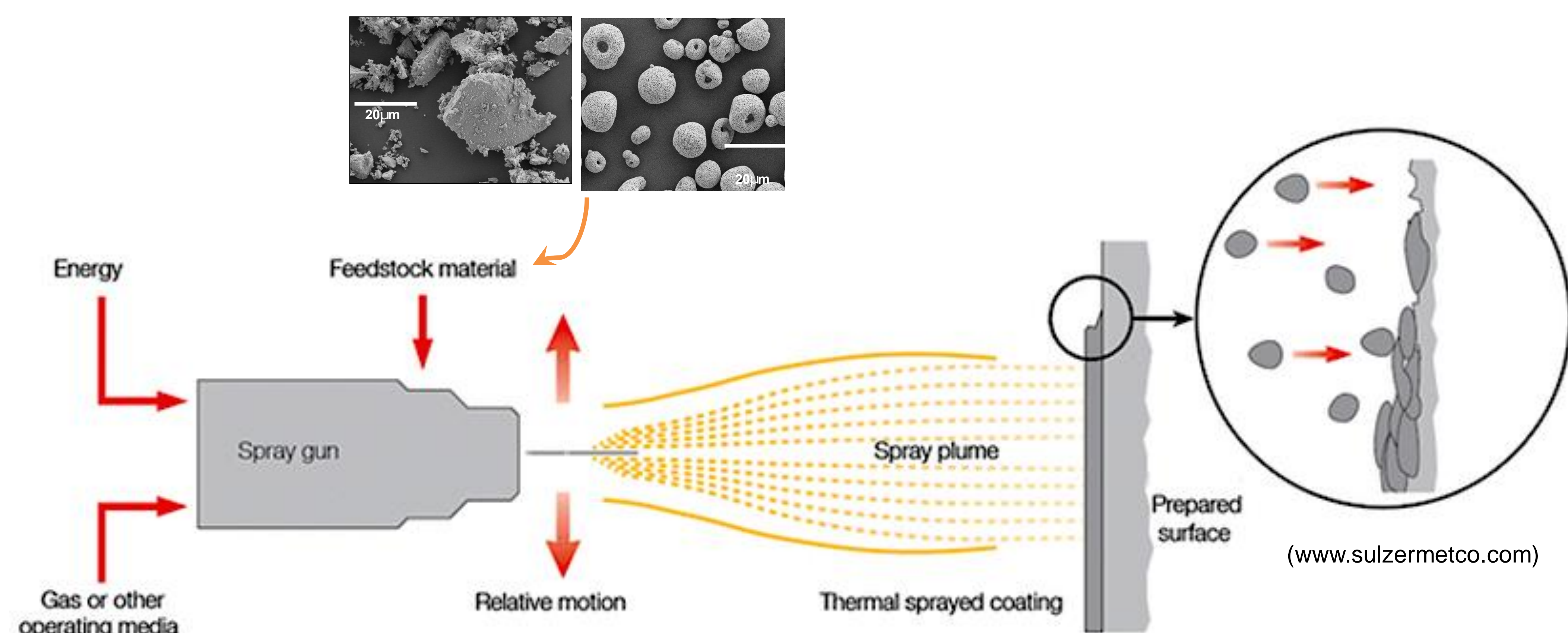
# Advanced Heat Transfer and Surface Technologies (AHTST) Laboratory



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## THERMAL SPRAY

Thermal spraying is a process in which a high-temperature heat source is used to melt and accelerate micron-sized metal, ceramic, or alloy particles to build thick protective coatings on industrial machine component substrates. Molten and semi-molten particles impact and spread on the component surfaces until several layers of the coating are fabricated. These coatings provide protection against degradation caused by corrosion, erosion, or high temperatures. .



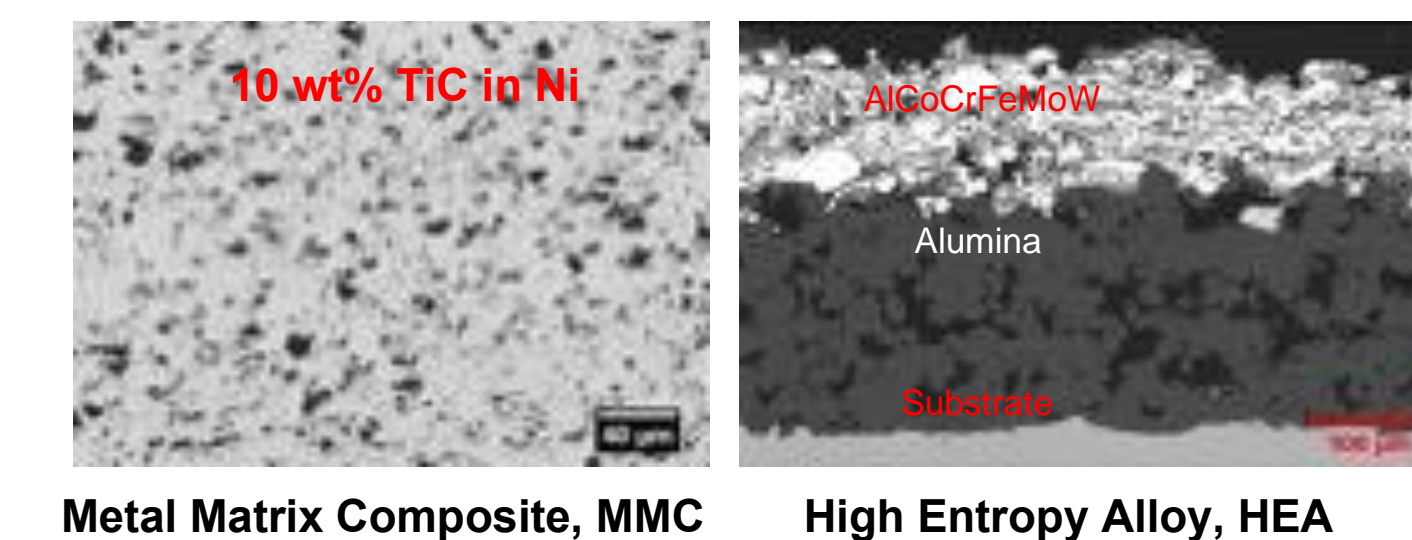
Schematic of the thermal spray process.

## CURRENT RESEARCH ACTIVITIES

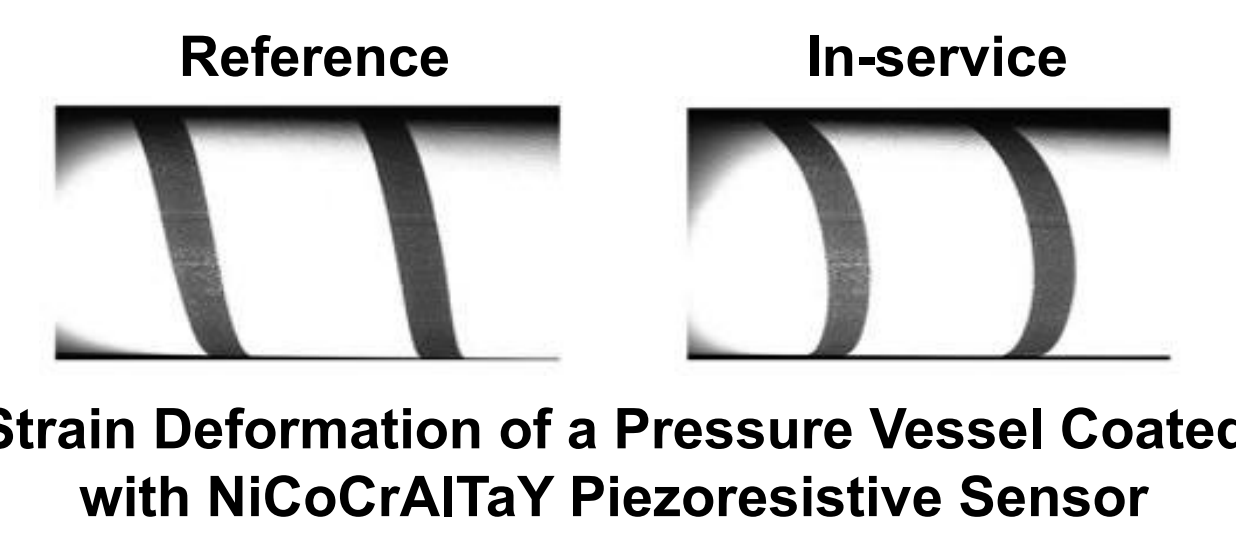
### Coatings as Heating Elements



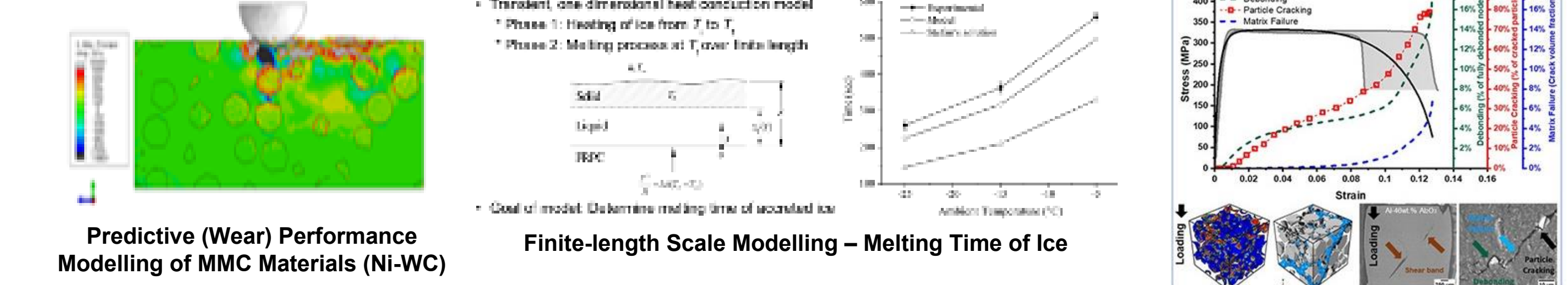
### Wear and Erosion Resistant Coatings



### In-service Health Monitoring Sensors



### Predictive Modelling



## EMERGING RESEARCH PRIORITIES

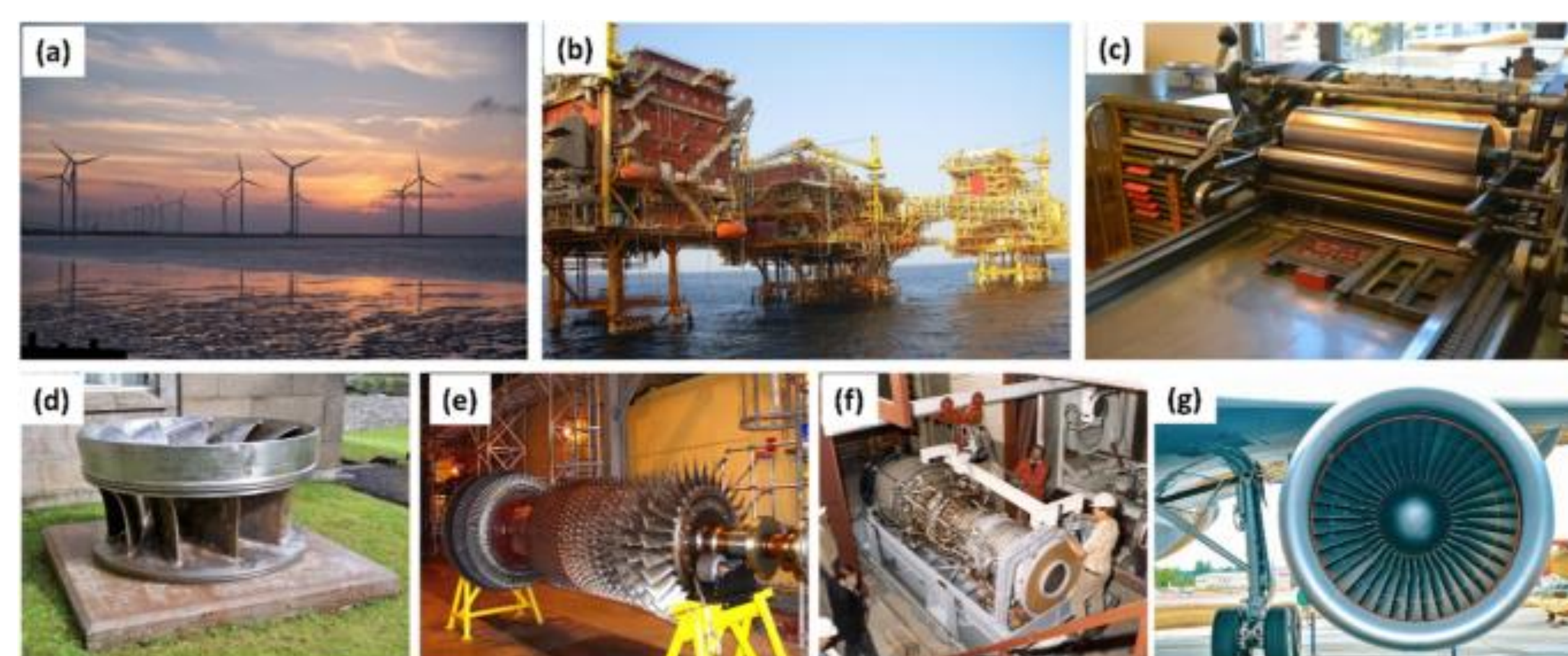
- Critical Minerals
- Autonomous Fabrication .
- Hydrogen Economy
- Low-carbon Energy Generation

## APPLICATIONS

### Aerospace and Defence



### Energy Generation



### Natural Resources and Agriculture

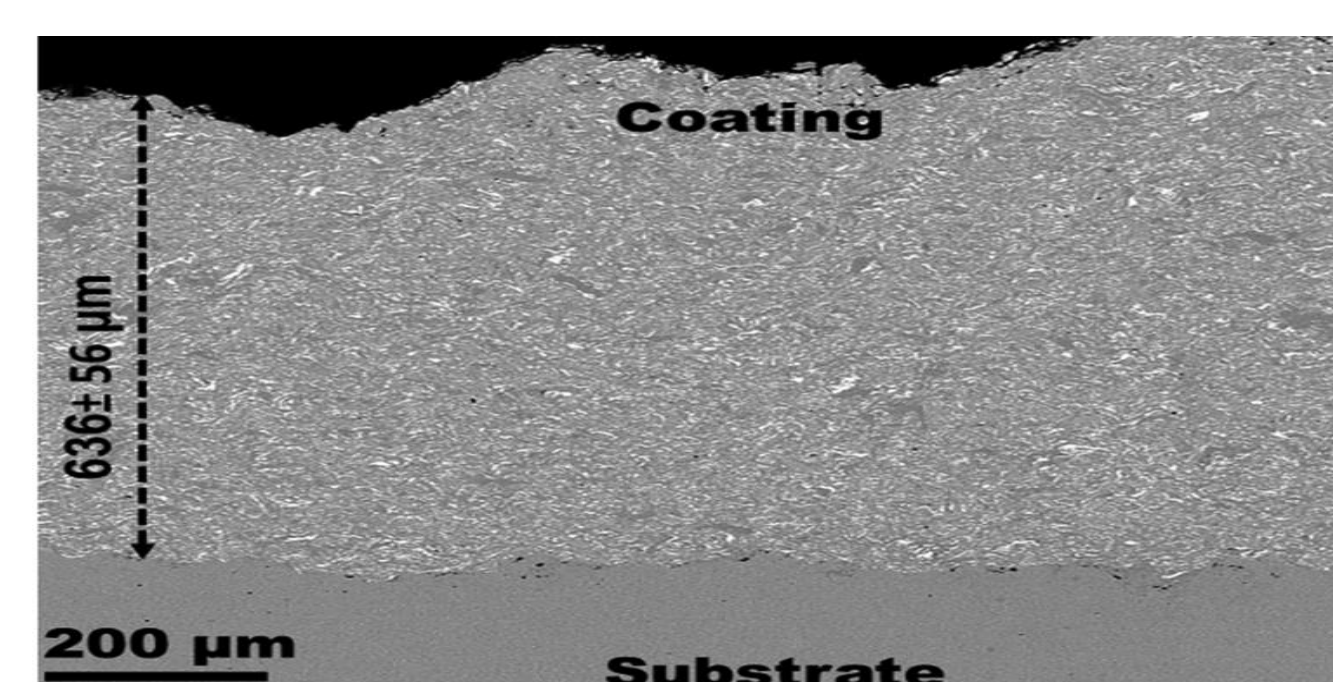


## COLD SPRAY

The high impact speeds of the particles promote rapid spreading, plastic deformation, and the deposition of a highly dense layer of particles. Bonding between the deposited particles is typically metallurgical, coupled with mechanical interlocking. The absence of high temperature particle heating during the deposition process eliminates oxidation, promotes retention of the properties of the original stock powder, induces low residual stresses in the coating, permits the deposition of thermally sensitive materials such as polymers, and facilitates the deposition of highly dissimilar materials.



Cold spray nozzle



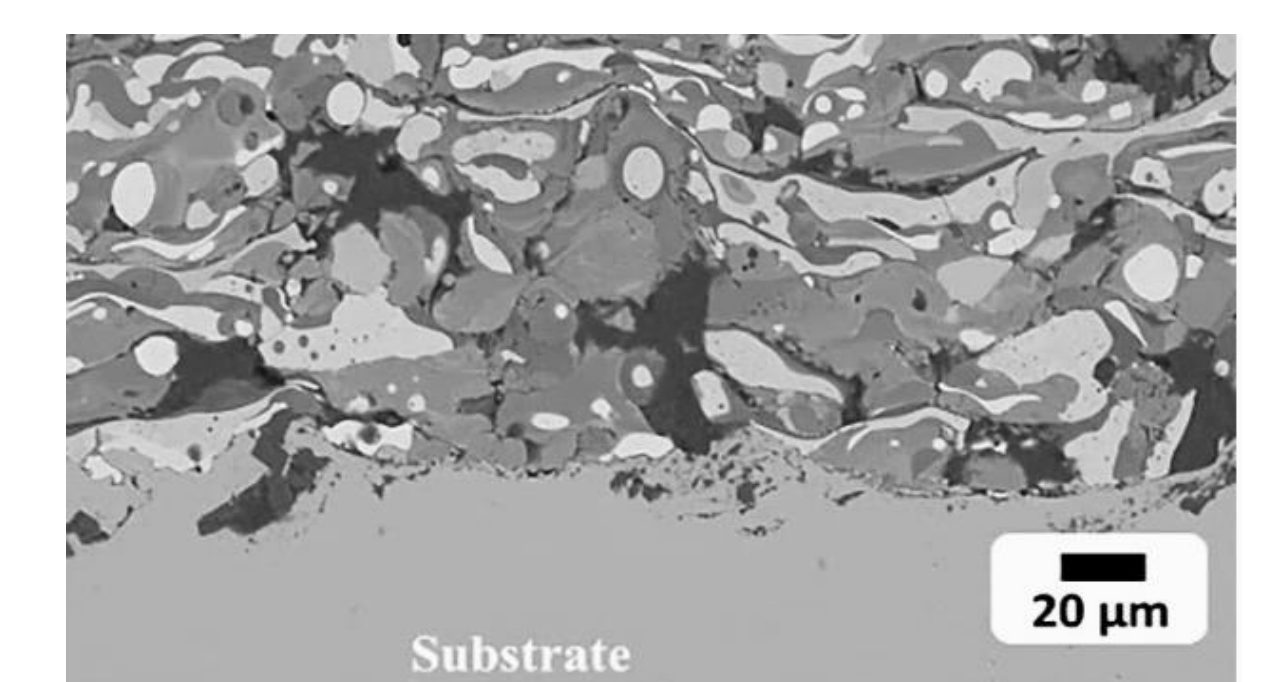
Cross-sectional micrograph of wear resistant cold sprayed AlCoCrFeMoV high entropy alloy (HEA) coating.

## FLAME SPRAY

With flame spraying, heat that is generated from the combustion of a mixture of oxygen and a fuel gas, commonly oxy/propane or oxy/acetylene is used to melt particles. The molten material is atomized and sprayed to build up a coating layer. The temperature of the flame can be higher than 3000 °C, making the process ideal for deposition of ceramic coatings.



Flame spray torch



Cross-sectional micrograph of wear resistant flame sprayed AlCoCrFeMoV high entropy alloy (HEA) coating.