



An Image-Based Methodology for Thermo-mechanical Characterization of the Thermal Spray Coatings



Methodological Approach



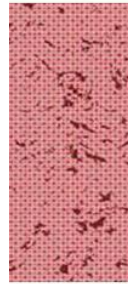
(A)



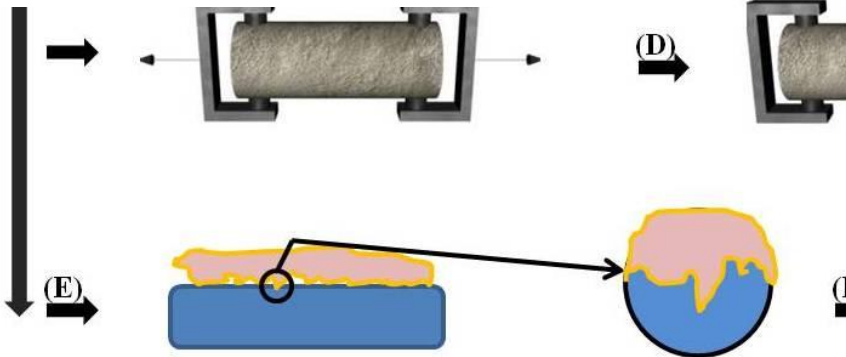
(A): Deposition

The proposed research is in the area of *Materials Science Research*. An important challenge remains in aerospace industry is material development, material characterization and structural integrity. Development of high performances materials requires extensive knowledge of their thermo-mechanical properties.

NASA Strategic Plan (2006-Goal#4): “Bring a New Crew Exploration Vehicle into service as soon as possible after Shuttle retirement“.



2010 Science Plan for NASA’s Science Mission Directorate: the requirement for “new measurement techniques or increases in spacecraft performance which in turn require technology advances” as one of the important strategies when “mature technologies through focused efforts prior to committing to implement missions” are required.



(E)





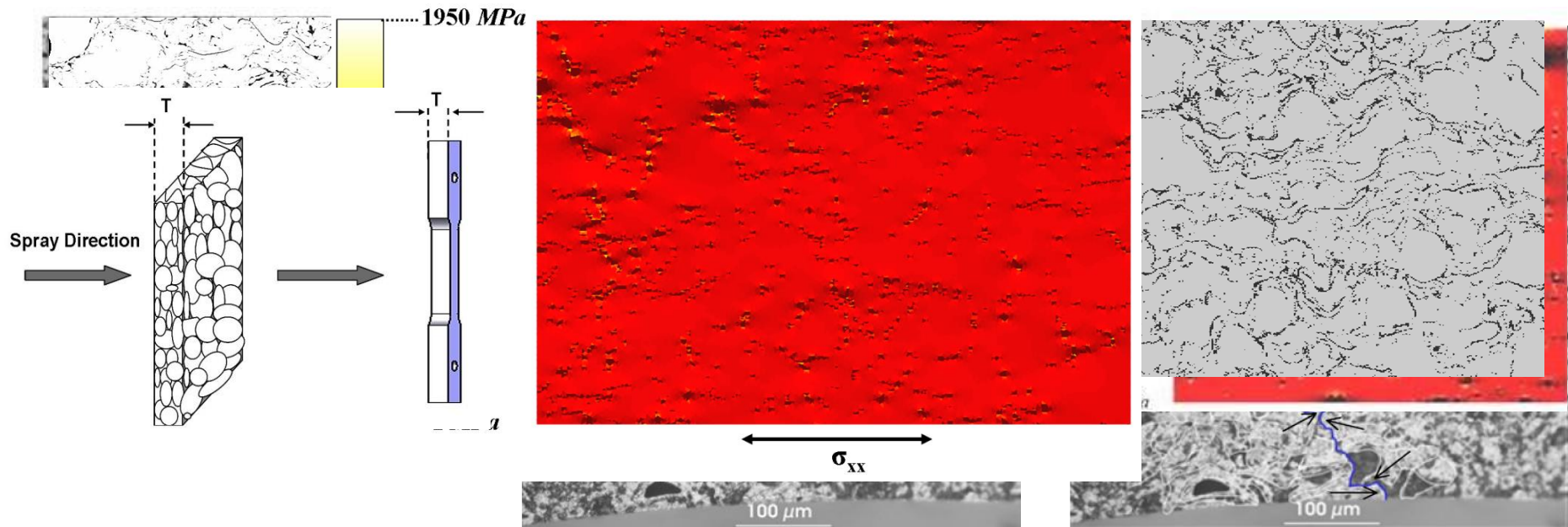
An Image-Based Methodology for Thermo-mechanical Characterization of the Thermal Spray Coatings



Progress and Accomplishments

Study on different types of coatings deposited by a variety of thermal spraying techniques

APS Deposited ZrO_2 on SiC





An Image-Based Methodology for Thermo-mechanical Characterization of the Thermal Spray Coatings



Collaborations, Student Involvement, Publication

**National Aeronautics and
Space Administration**



Ames Research Center

1 Graduate Student: *Milad Bashirzadeh*

1 Undergraduate Students: *Chris Leither*

ITSC 2011- Hamburg- Germany, Sept 2011,” Investigation on Mechanical Properties of Cold Sprayed Aluminum Coatings using Image-based Finite Element Method”- Paper No. 2502

ASME- McMat2011-Chicago, May 2011, “Effect of Substrate Temperature on Microstructural Characteristics of Thermal Sprayed Superalloy 625”- Paper Number: McMat2011-4422



An Image-Based Methodology for Thermo-mechanical Characterization of the Thermal Spray Coatings



Future Plan

- ✓ Literature review and preparing logistics and experimental platform, Recruit student
- ✓ Coating deposition and experimental sample preparation
- + Microstructural characterization, Computational characterization (Image processing, FEM analysis)
- + Mechanical experiments
- + Micromechanical coating interface modeling
- + Failure study of the interface and the coatings
- + Prepare an end-of-year award report on this research with the ND EPSCoR office

✓ Completed

+ In Process

PI plans to submit a research proposal in response to NSF, *Materials and Surface Engineering (MSE)* program. (Sept 2011).

Project title: *Thermo-mechanical Characterization of the Thermal Spray Coatings using Image-based Micromechanical Computation and Experimental Evaluation*