

Kick off meeting for EPSRC/DST
project

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Improvements in gas turbine
performance via novel plasma
spray coatings offering
protection against ingested
species

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The Cranfield Team

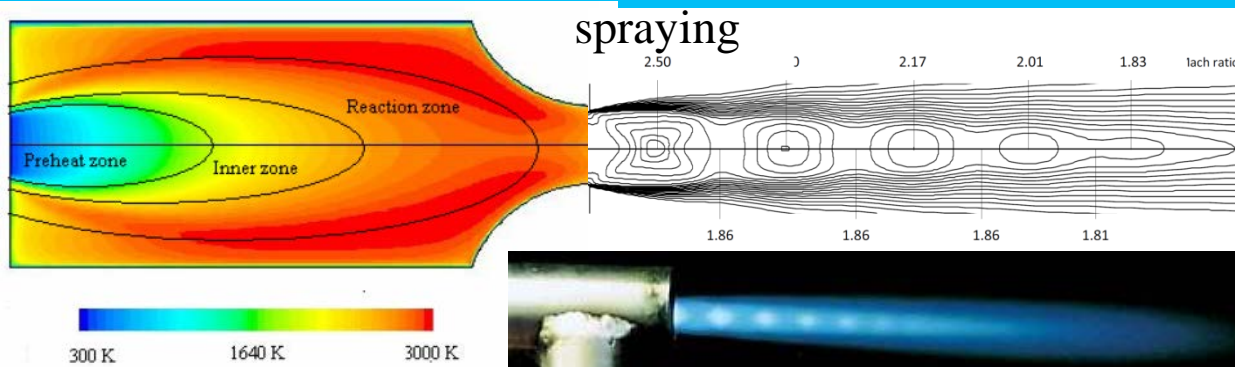
- Specialized in modelling of complex multiphase and multiscale problems.
- 30+ PhD/post-doc researchers
- Key areas include material processing and energy conversion
- Close collaborations with industry with successful completion of 20+ KTP, TSB and Industrial CASE Award projects
- Establishing a Cranfield Sustainable Technology Centre in Peterborough
- Currently led two EPSRC and four EU projects

Cranfield role in the programme

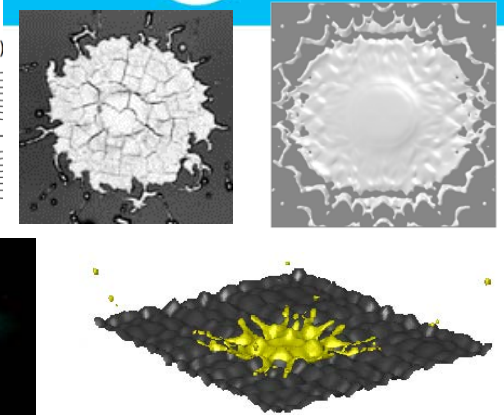
- Materials and Specimen Production
- Assessment of CMAS Particle Adhesion (Deposition Efficiency)
- **Modelling of CMAS Particle Impact and Adhesion**
- Effect of CMAS on Sintering and Spallation
- Development of CMAS-resistant TBC formulations
- **Modelling of the SPPS manufacturing process**

Modelling Platform for Thermal spraying

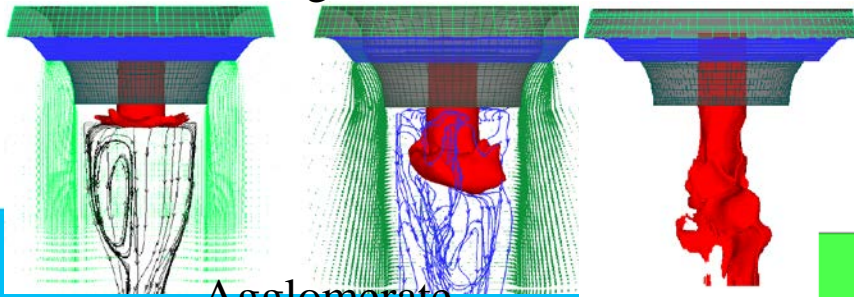
Gas Flow in thermal spraying



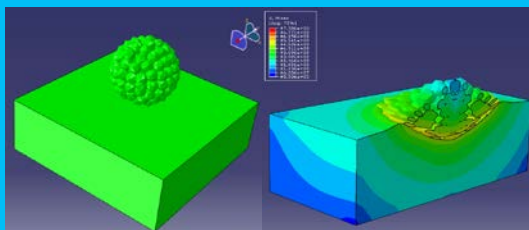
Droplet impact



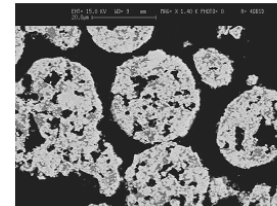
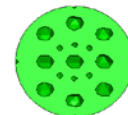
Atomisation for powder manufacturing



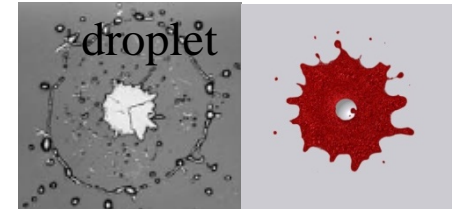
Agglomerate



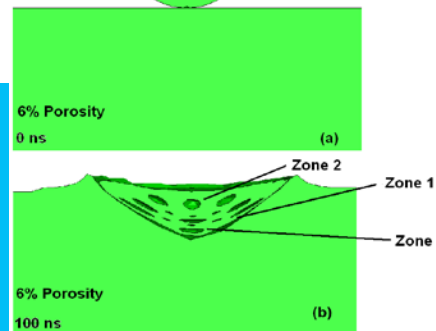
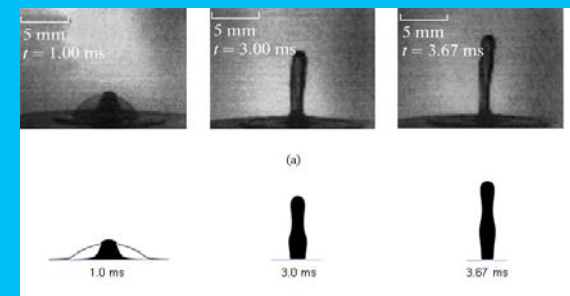
Nanostructured particles



Semi-molten droplet



Hollow droplet

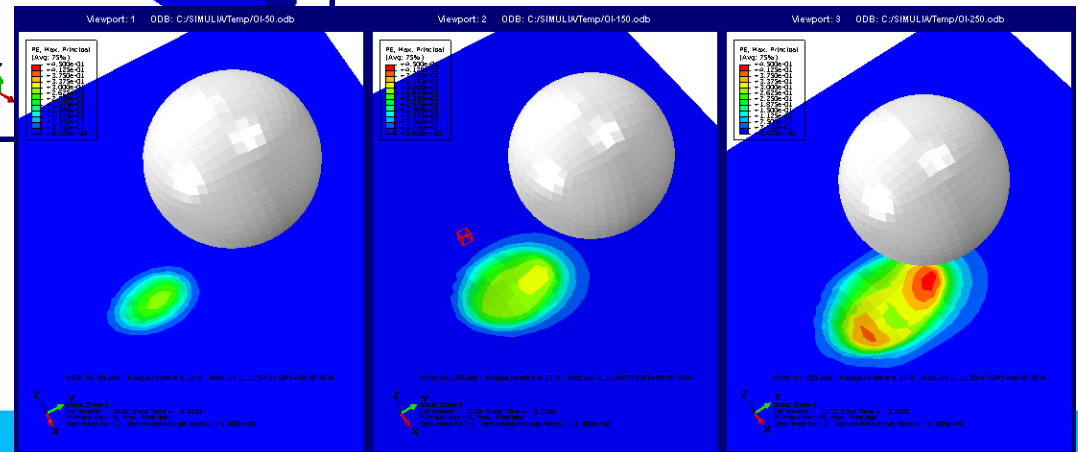
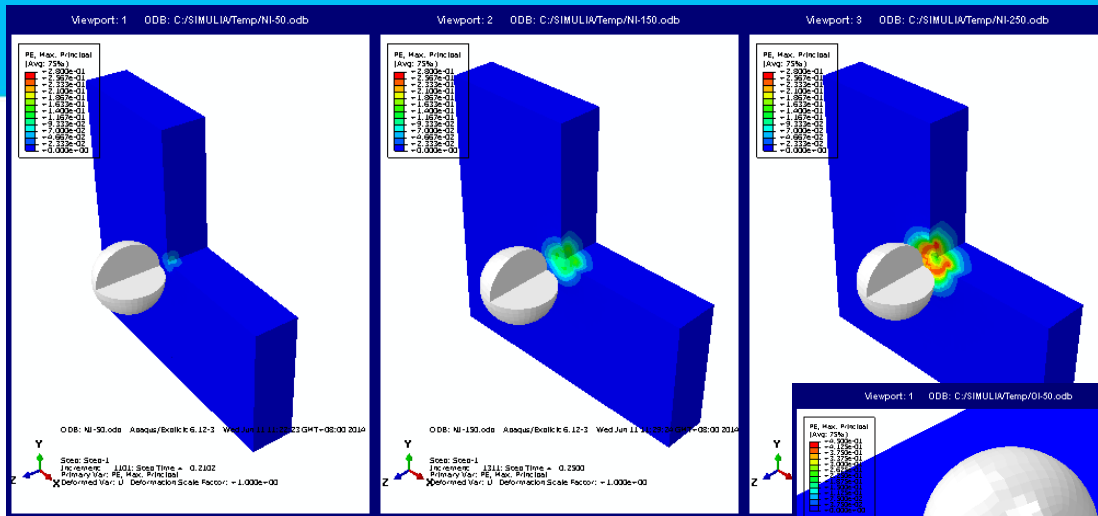


Modelling of CMAS Particle Impact and Adhesion

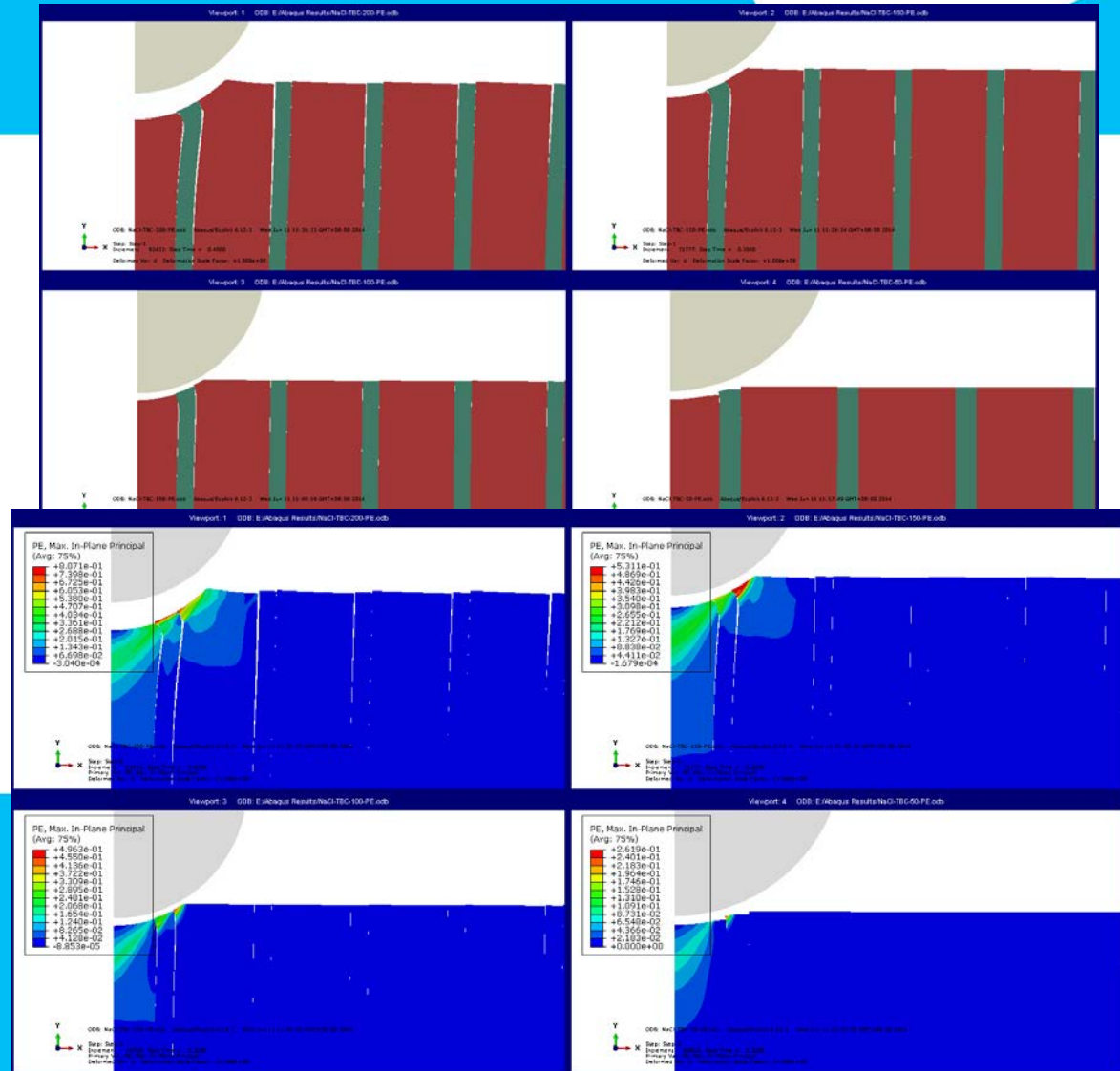
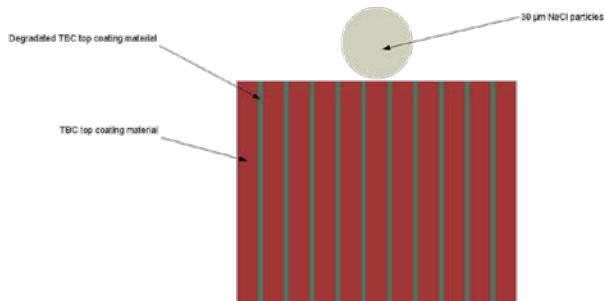
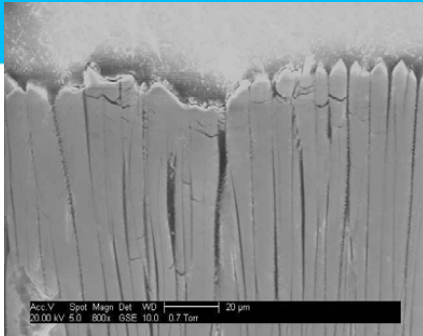
Initial impact models

- Salt particles: elasticity only
- Substrates
 - Nickel: Johnson-Cook plasticity model
 - EB-PVD: degraded columns

Impact on flat substrate (Nickel)



Impact on EB-PVD

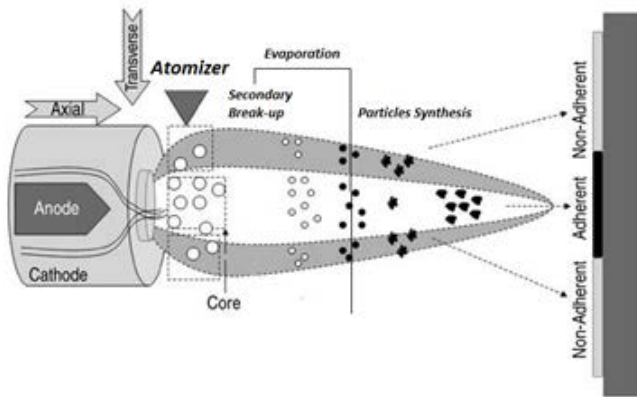


Work to follow

- Impact on PS coatings
- Vermiculite particle impact

Modelling of the SPSS manufacturing process

- Body copy, Arial 20pt



- Modelling of gas phase: fluid dynamics, chemical reactions, electromagnetic effects
- Modelling of liquid phase: evaporation and droplet dynamics
- Modelling of aerosole: formation, transport, sintering and coagulation