



Dr. Gunjin Yun

- KAIST BS (1994) / MS (1996)
- University of Illinois Urbana-Champaign PhD (2006)
- Washington University in St. Louis Post-Doc (2007)
- 1996-2002 Samsung Corporation Institute of Technology Researcher
- 2008-2013 The University of Akron, Assistant Professor
- 2013-2016 The University of Akron, Associate Professor
- 2016-Present Seoul National University, Professor
- Air Force Summer Faculty Fellowship (2012, 2013)
- NASA GRC Research Grants (2009-2012, 2014)



IN ASML

Aerospace Structural and Materials Laboratory has been conducting cutting-edge research on multiscale and multiphysics problems including thermal structural behavior, life prediction, nonlinear deformation and damage models of aircraft structures and composite materials used in extreme loads, including complex loads and high temperature / high pressures. We are working on both experimental and simulation research on composite materials.

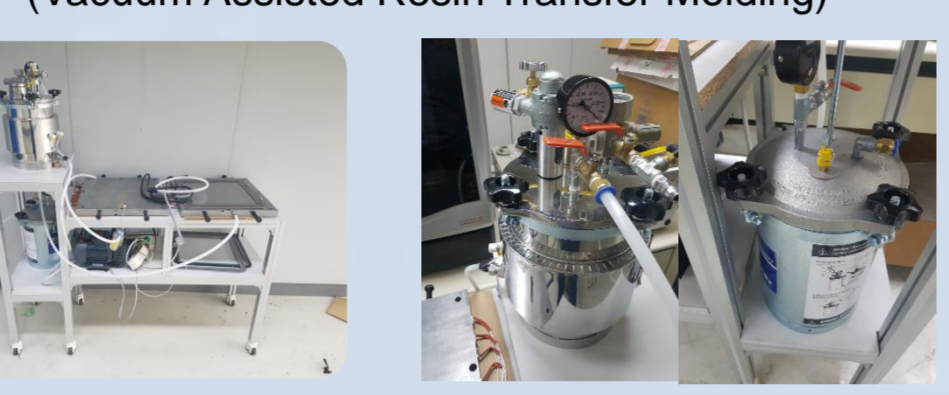
Clustered Super Computer



MTS Tester Machine



VARTM

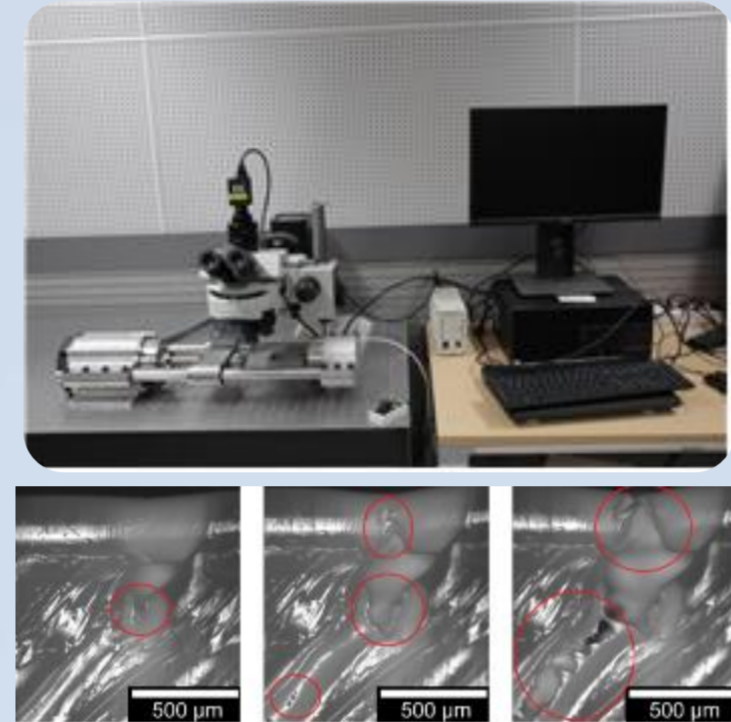


3D Digital Image Correlation System



μTS

(Microscope Mechanical Test System)



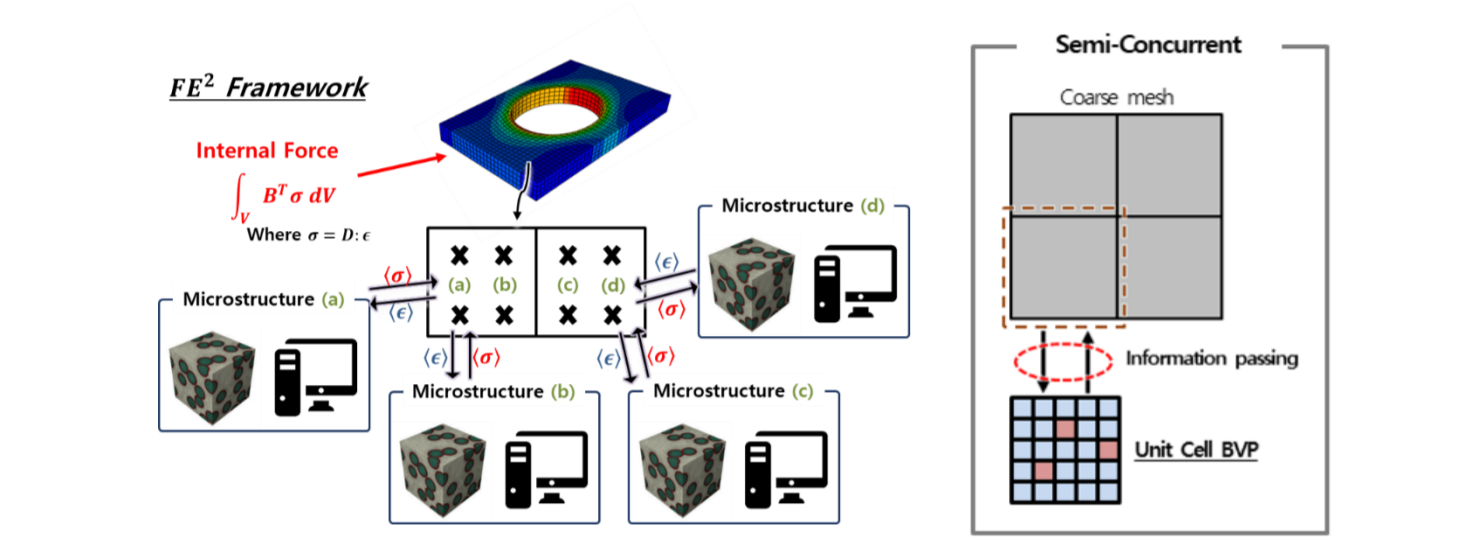
3D Printer



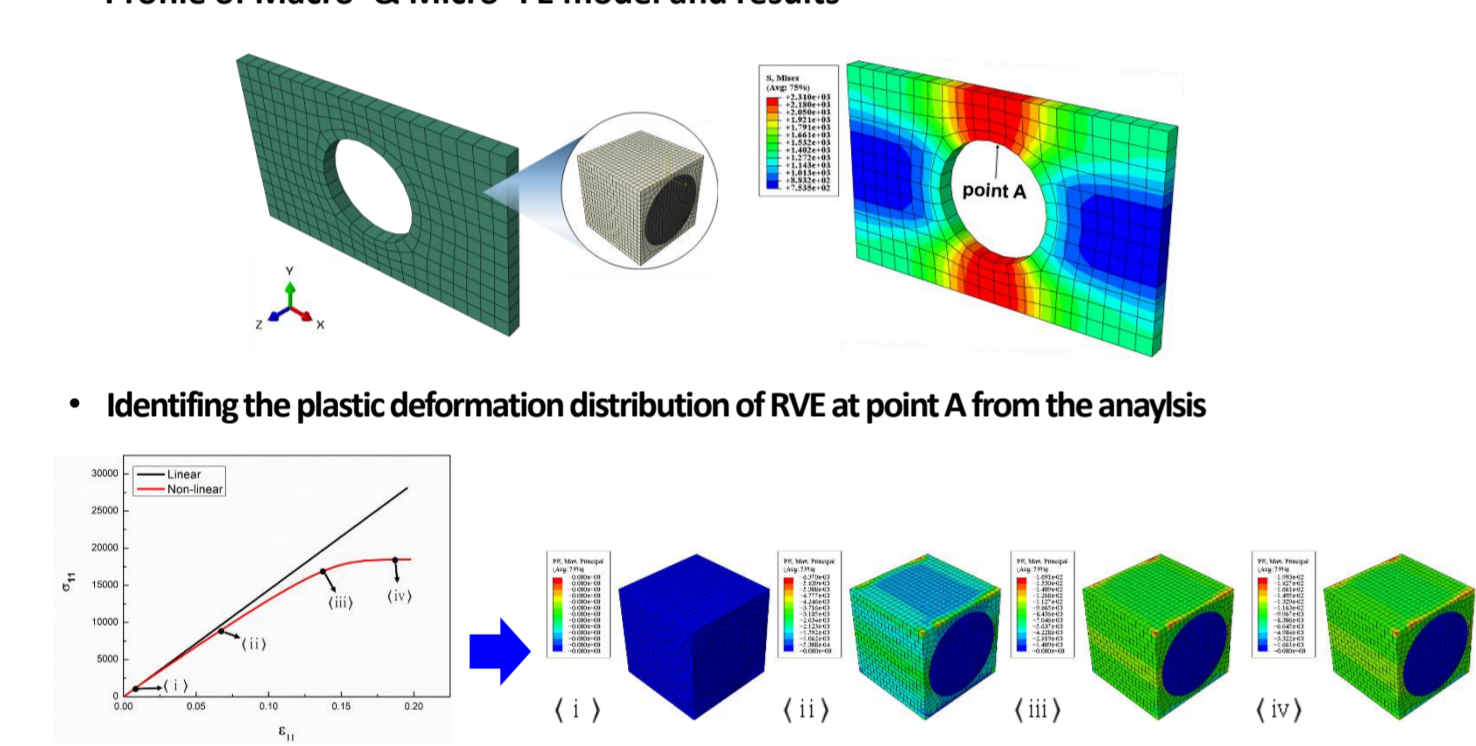
FE Multiscale Analysis for Composites

FE² Multiscale Analysis for Composite Materials

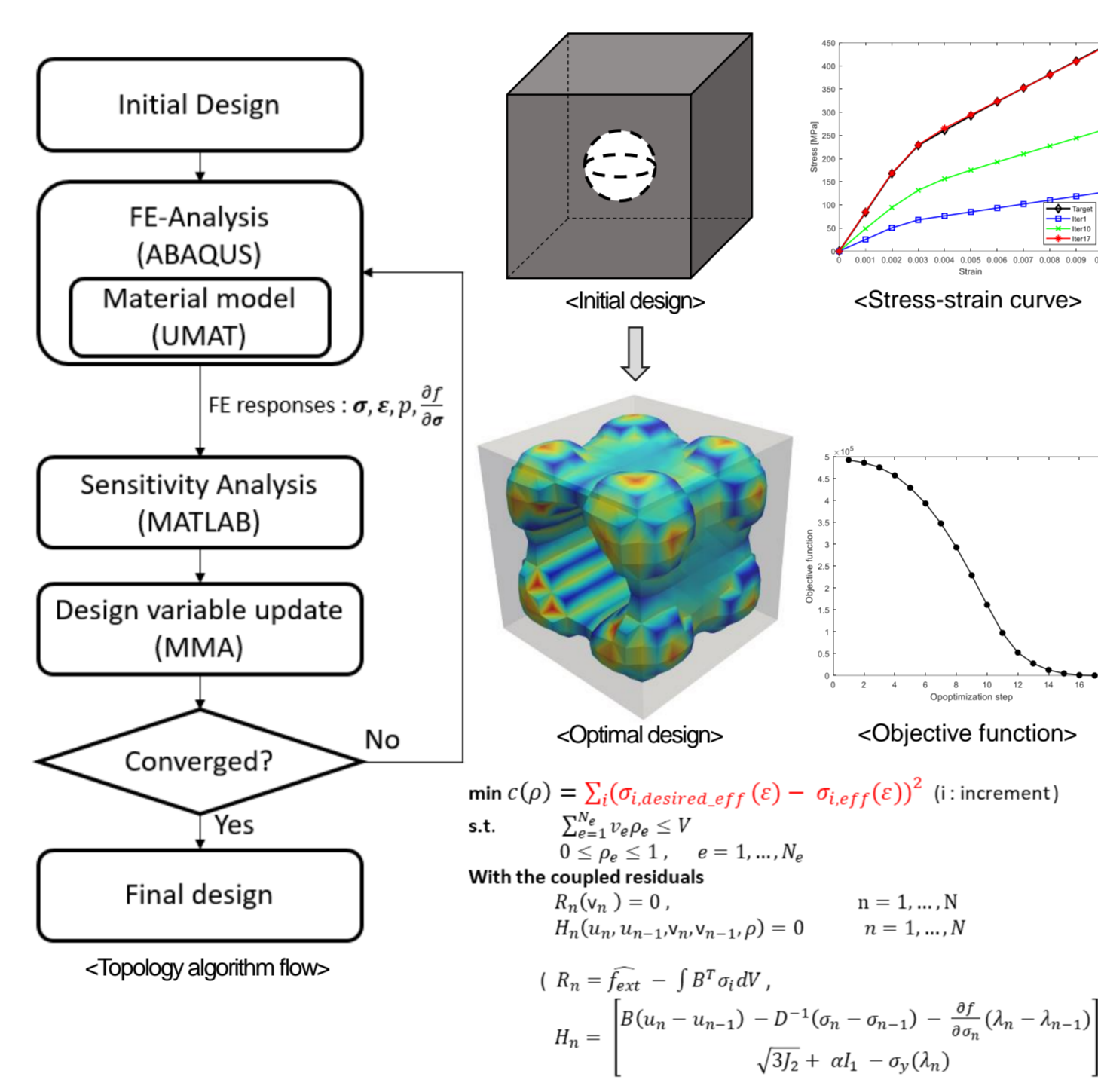
• FE² Multiscale Analysis is one of the numerical homogenization scheme for predicting effective properties of composite materials by solving each scale problems



FE² Multiscale Analysis Results



Microstructure Topology Optimization by Targeting Prescribed Nonlinear Stress-Strain Relationships



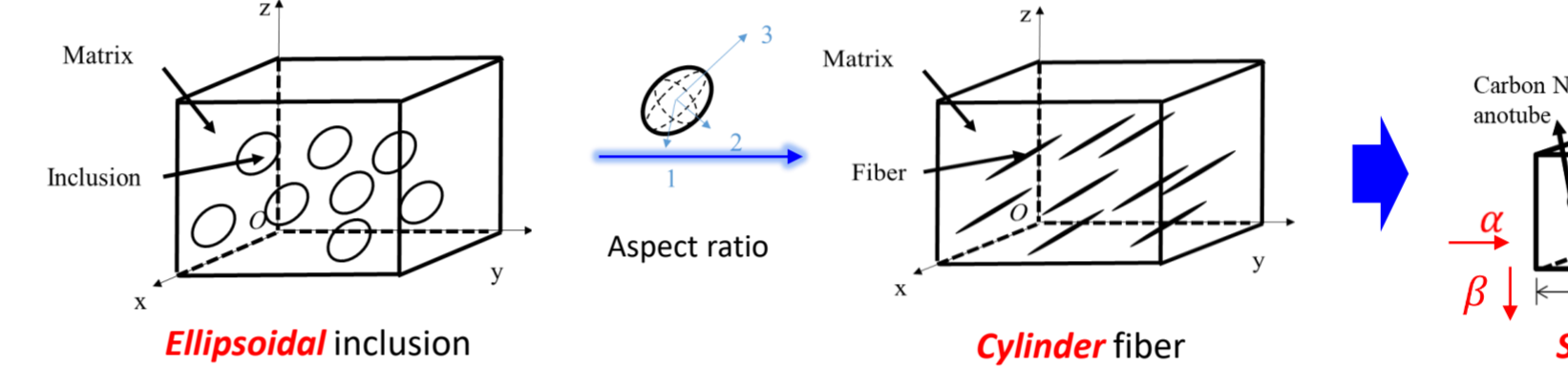
Nonlinear Micromechanics Analysis

Damage Plasticity Constitutive Model for CNT Nanocomposites

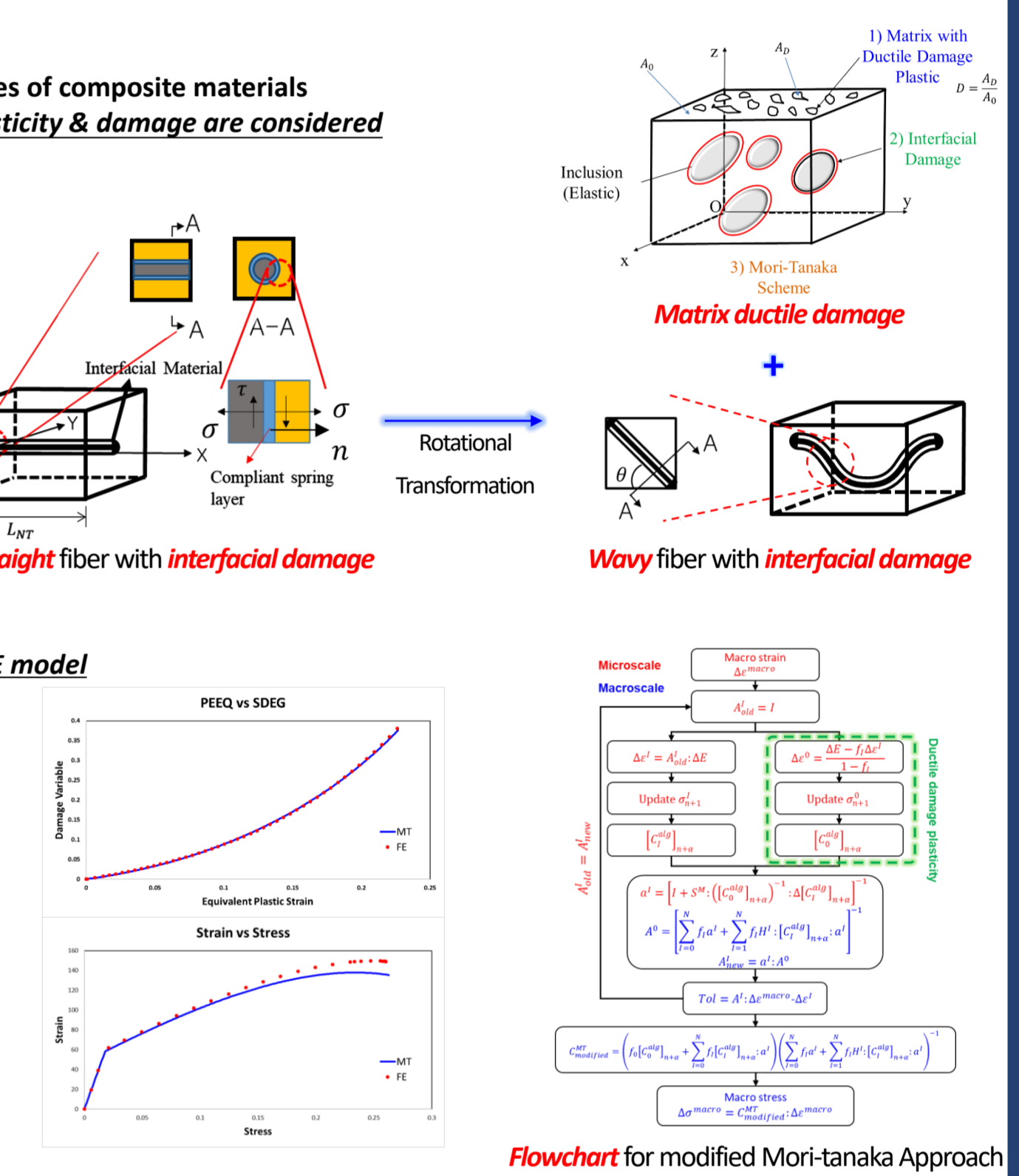
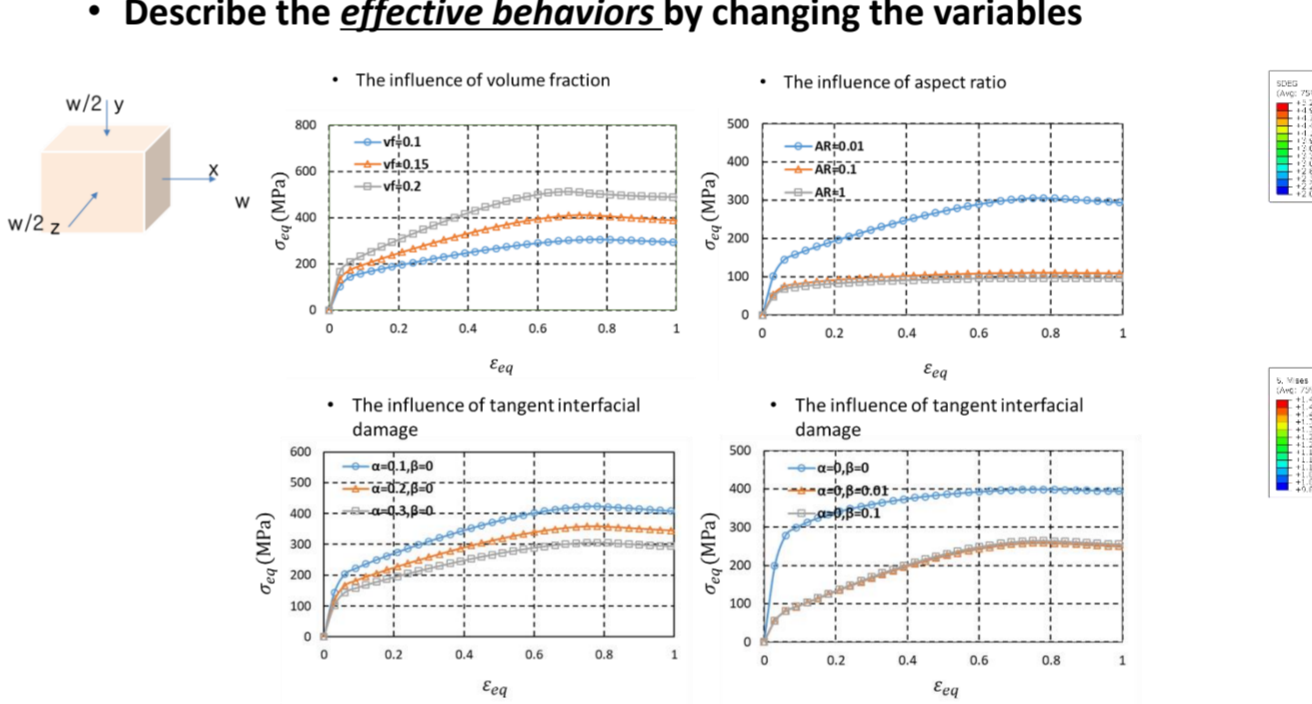
• Mori-Tanaka is one of the analytical homogenization scheme for predicting effective properties of composite materials

• In order to express physical comprehensive material behaviors, **nonlinear behaviors from plasticity & damage are considered**

Overall Scheme for Modified Mori-Tanaka Approach with Matrix Ductile Damage



Modified Mori-Tanaka Approach Results & Verifications with FE



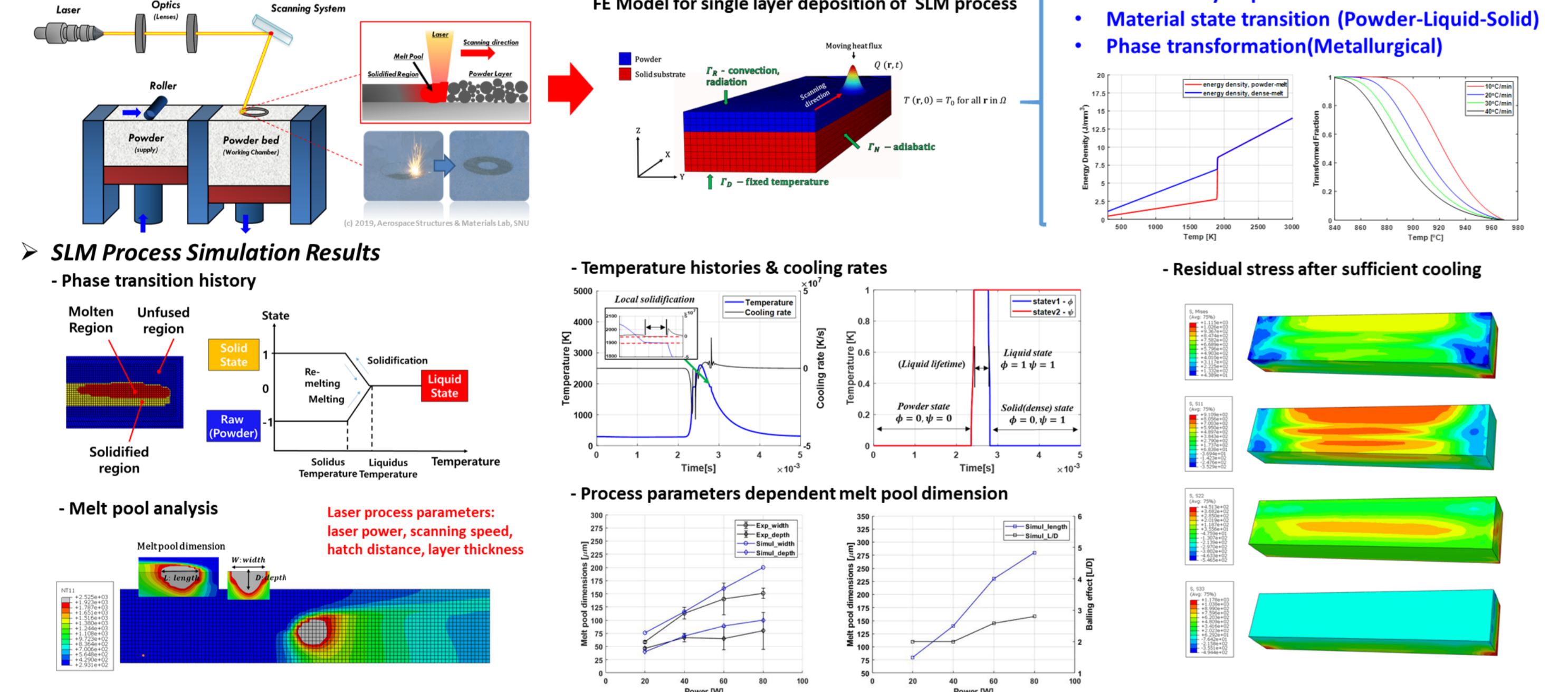
Selective Laser Melting (SLM) Process Simulation

Selective Laser Melting (SLM)

• Selective laser melting is one of the powder bed fusion (PBF) processes for metal 3D printing

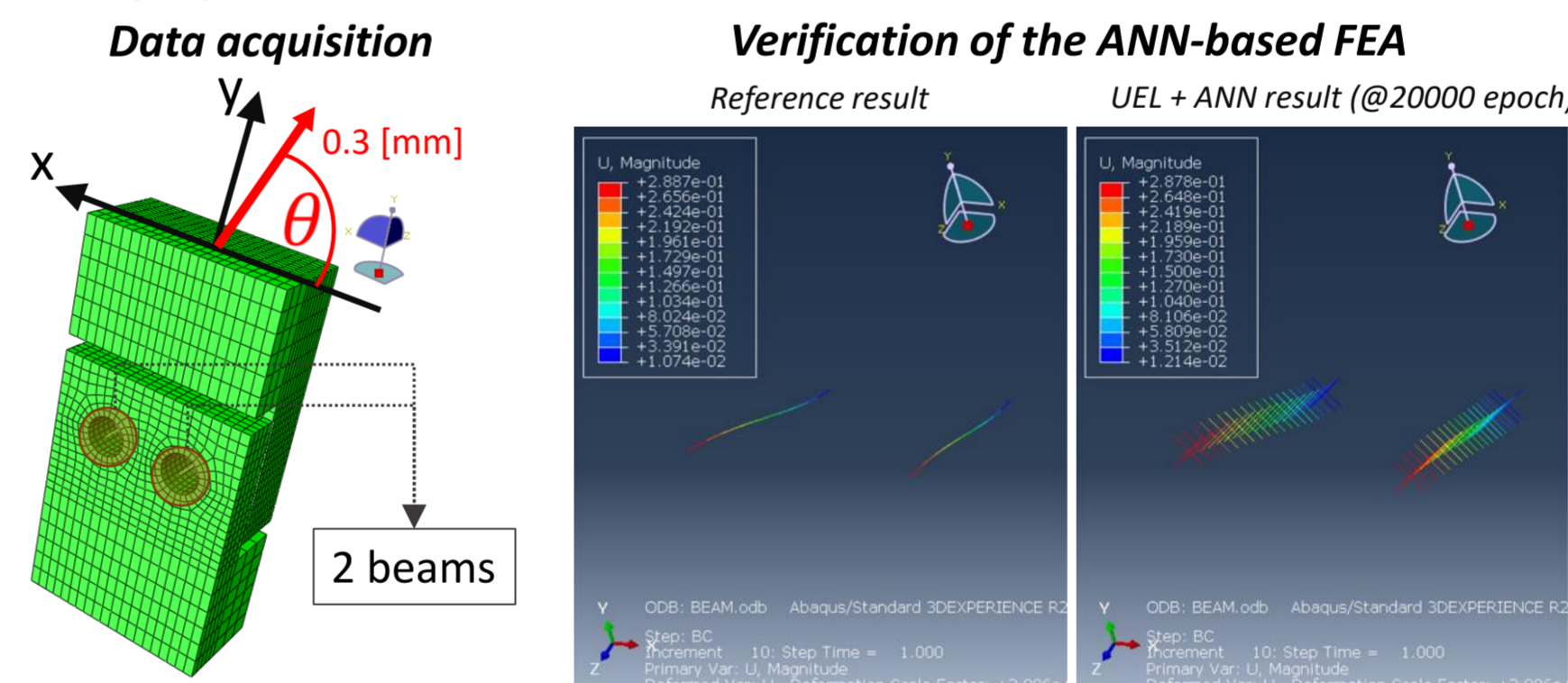
• Thermo-mechanical analysis framework for defect prediction and process optimization for SLM printing process

Numerical Modeling for SLM process

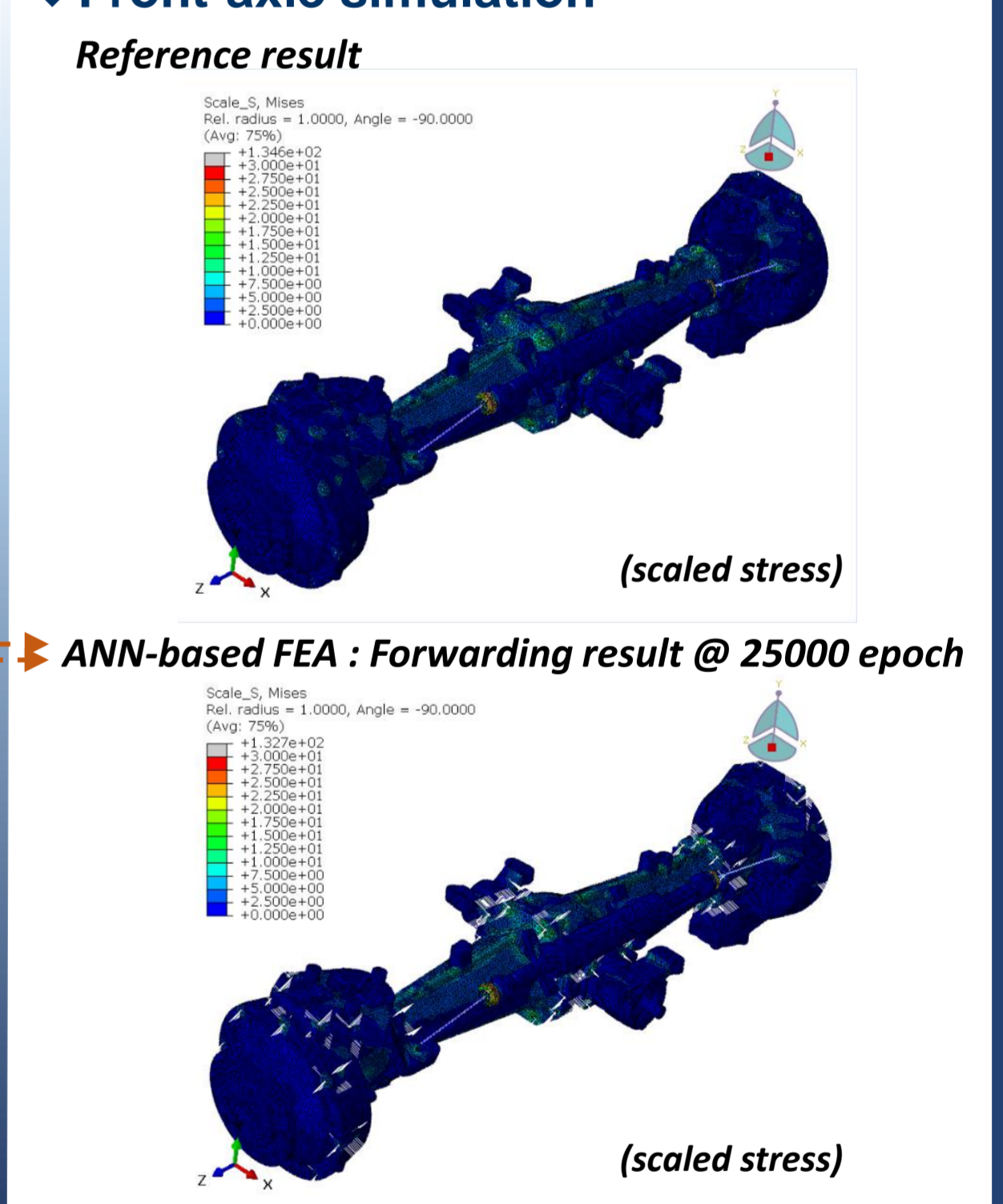


Deep Learning-based Joint Model for Hybrid FEA

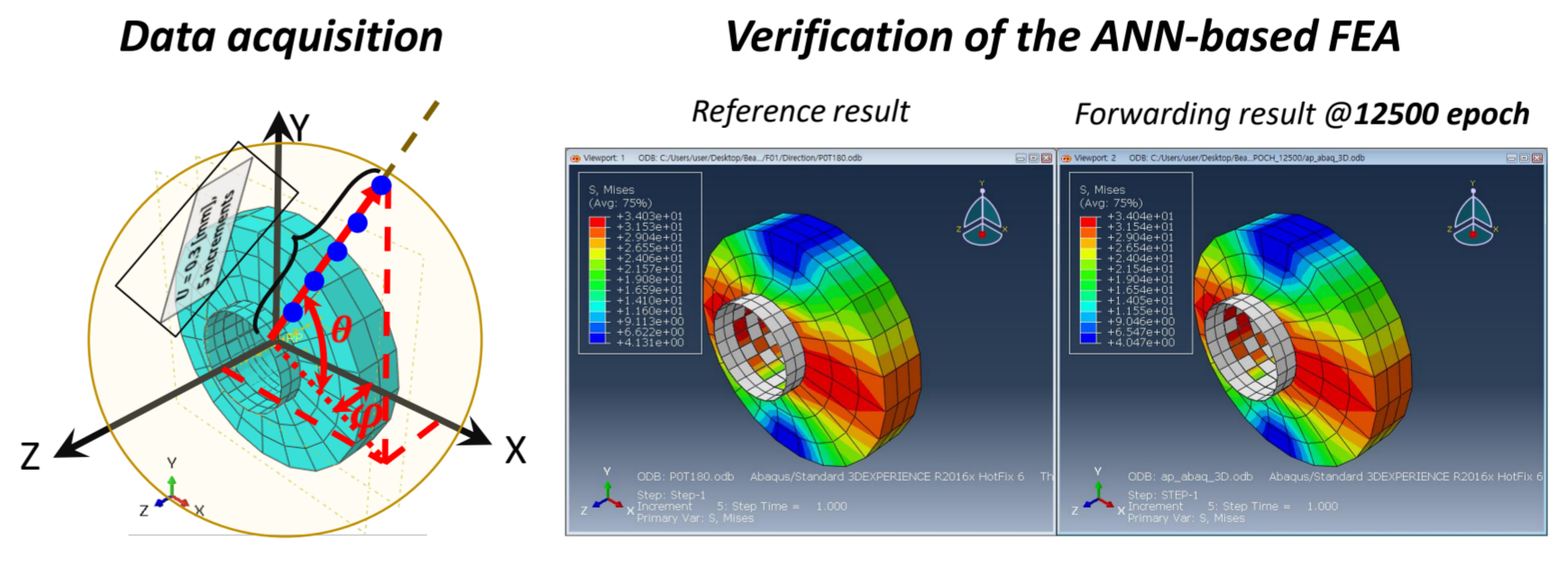
Bolts



Front-axle simulation



Bearings



Molecular Dynamics Simulation of Ablation

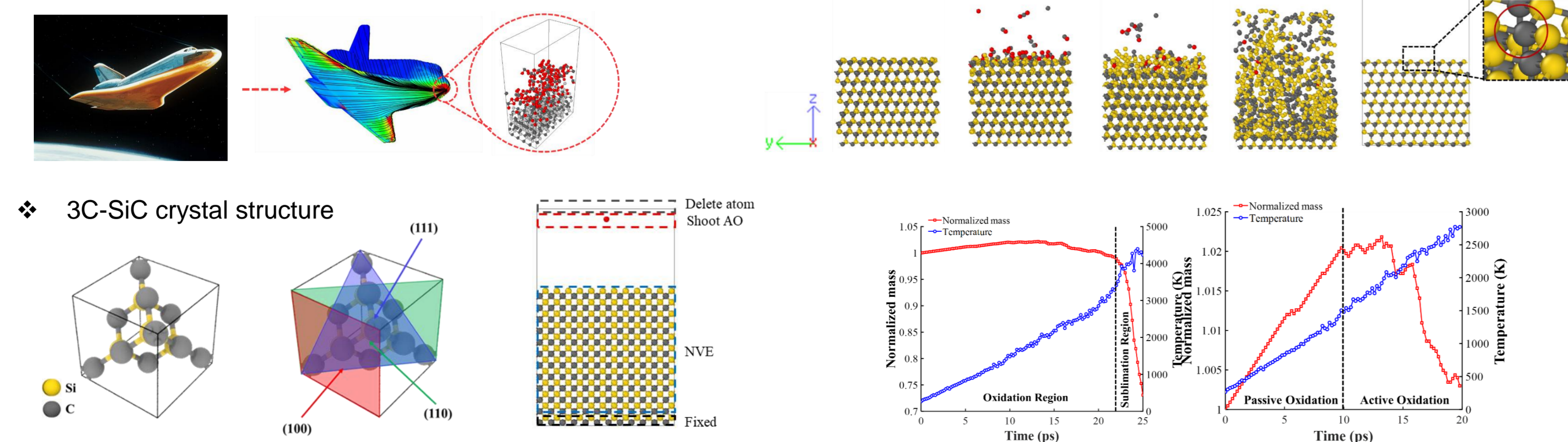
Thermal Protection System (TPS)

• Flight Vehicles with high speed are exposed to **harsh environment** in earth's atmosphere.

• Thermal Protection Systems are used to protect people and vehicles from hot temperature.

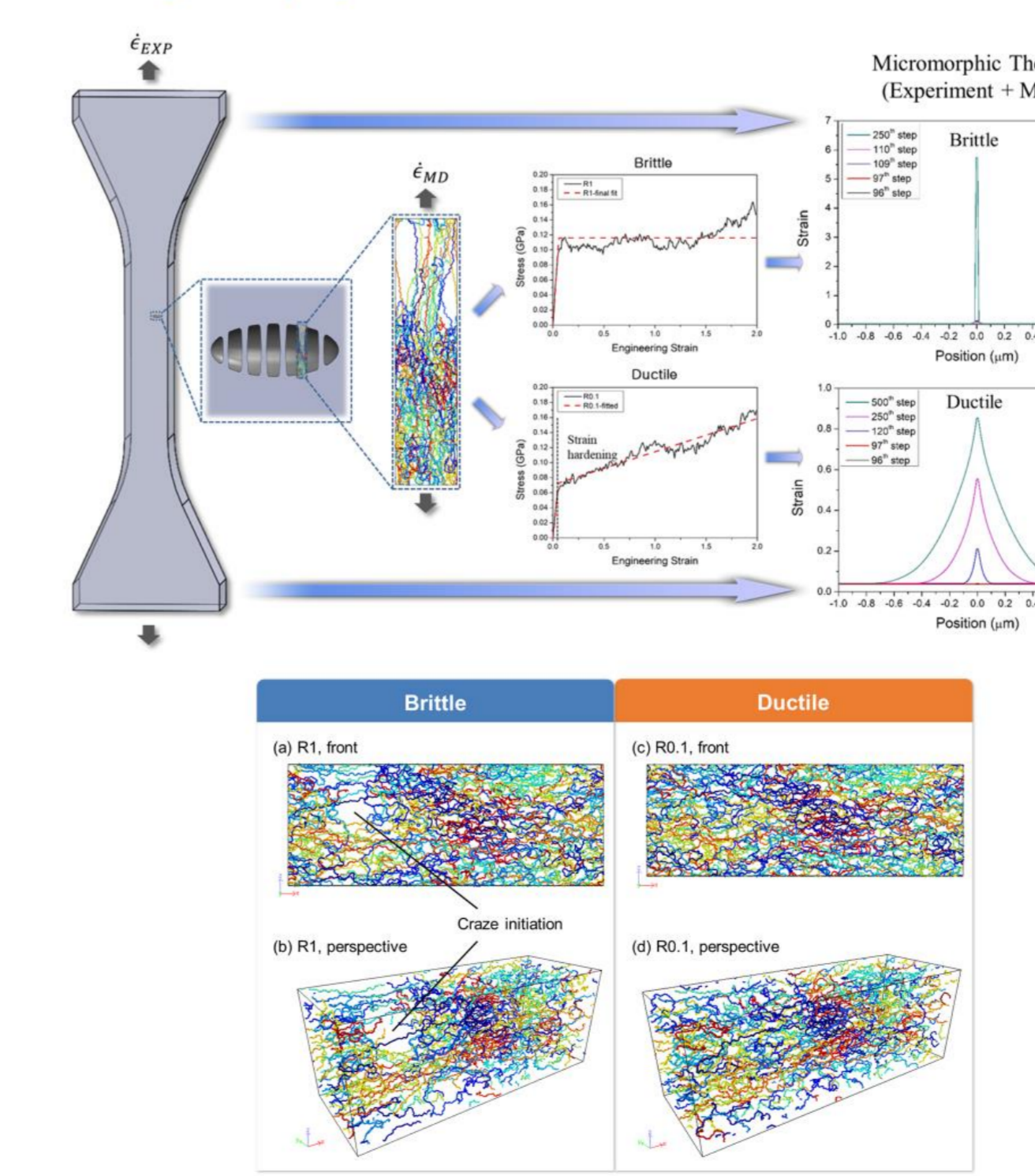
Multiscale Approach with MD (Molecular Dynamics) Simulation

• Using MD simulation, we can understand fundamental **chemical reactions** and improve an accuracy of computational modeling



Molecular Dynamics Simulation of Nanocomposites

Polymer-physics-based multiscale simulations



Coarse grained MD with multi-objective optimization

