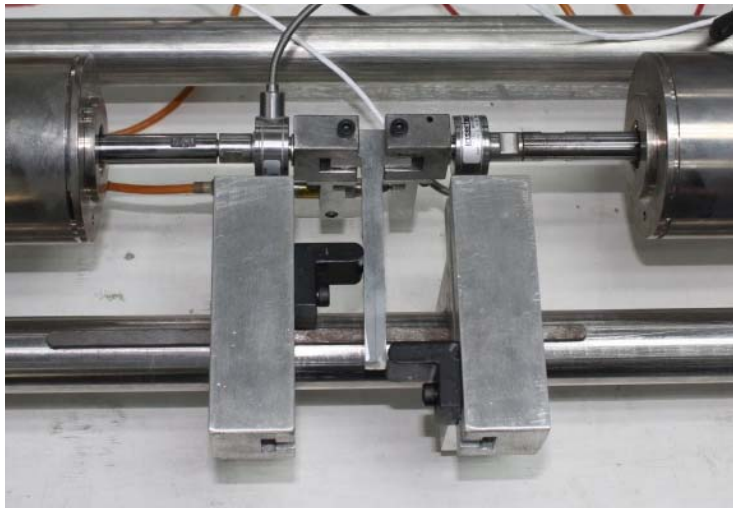
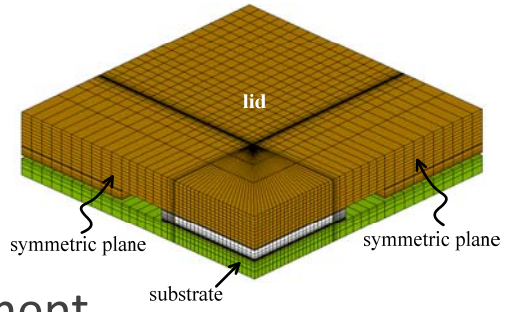
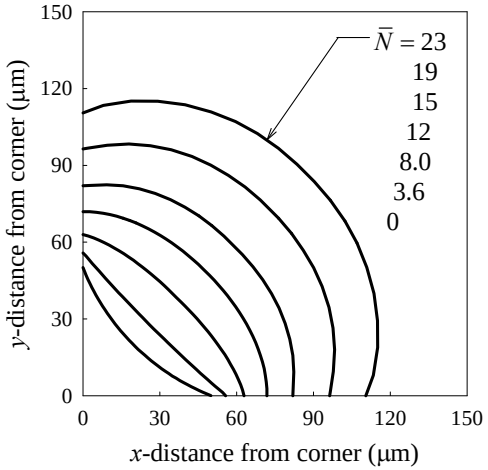
Research Topics

Interface adhesion characterization and delamination simulation

- Fracture resistance of materials interface
  - Critical strain energy release rate and fatigue growth rate measurements
  - Using 4-point bening, double cantilever beam, and mixed-mode bending beam apparatus
- Analysis of fracture mechanics problems
  - Analytical formula derivation
  - Finite element analysis with 3D VCCT
  - Fatigue growth model development

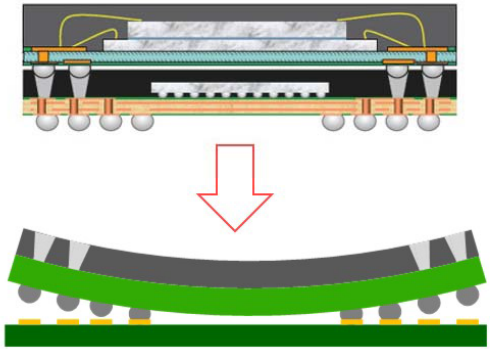




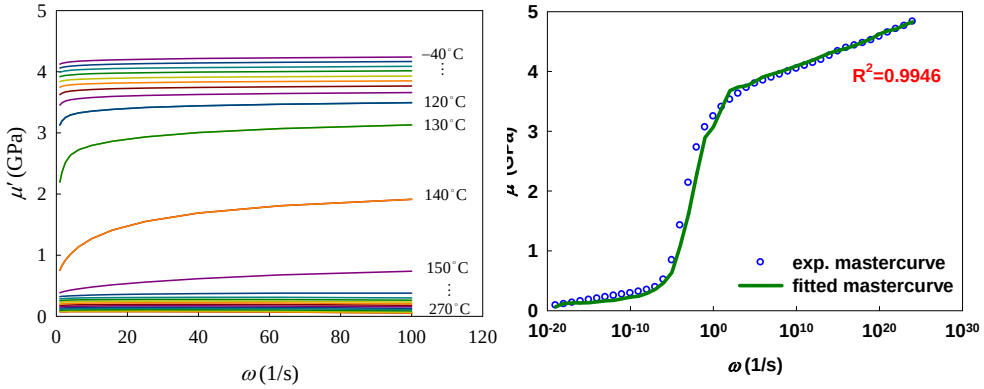


Viscoelastic model for warpage simulation

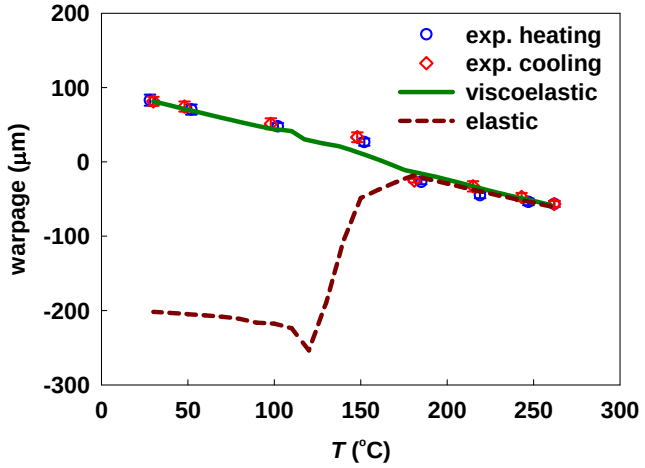
- Viscoelastic models of polymer materials are constructed by using tensile and shear DMAs
- Effects of polymer conversion and chemical aging at elevated temperatures are considered by DSC and TMA
- Finite element models considering these nonlinear effects are used to model package warpage



Warpage issue for PoP



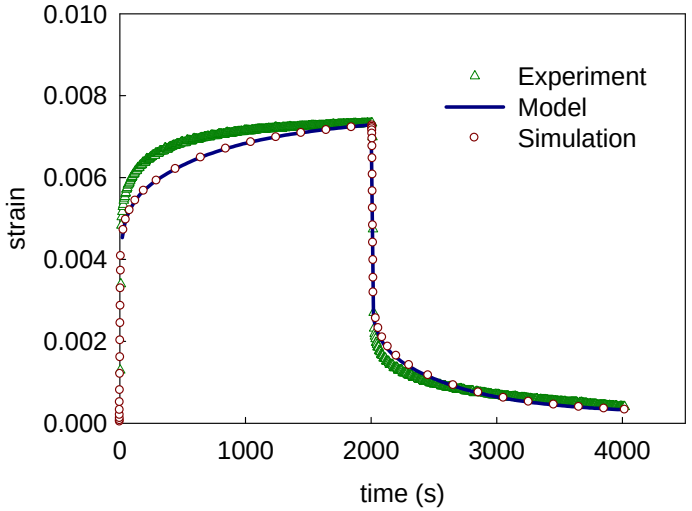
Shear storage modulus mastercurve

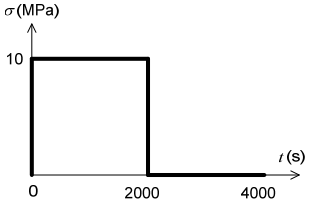


Warpage simulation

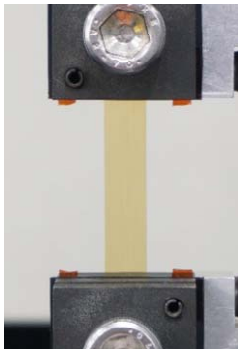
Polymer thin film characterization

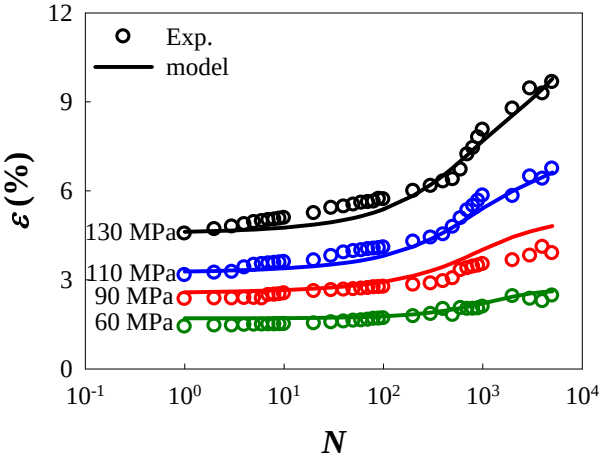
- Viscoplastic behavior characterization and constitutive model
- Fatigue response characterization and life prediction model

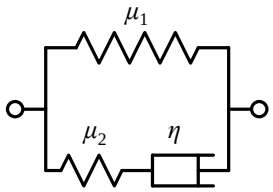


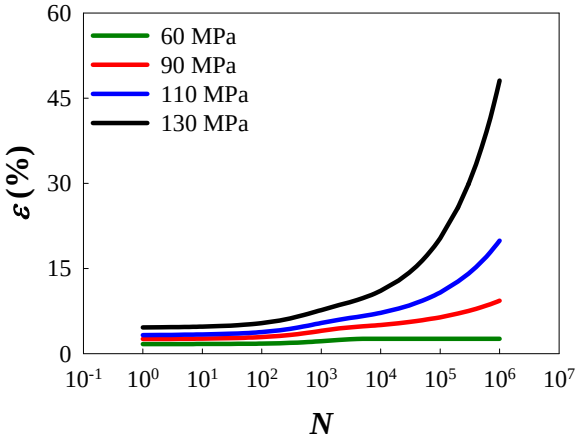


Creep and creep recovery at 60 °C





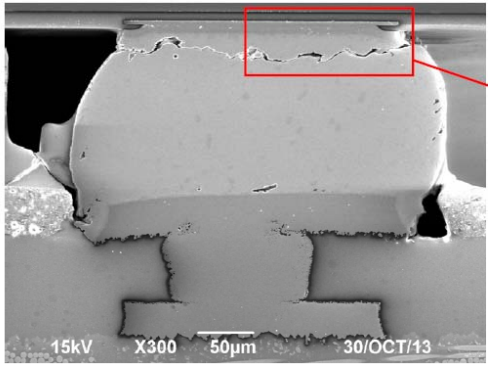




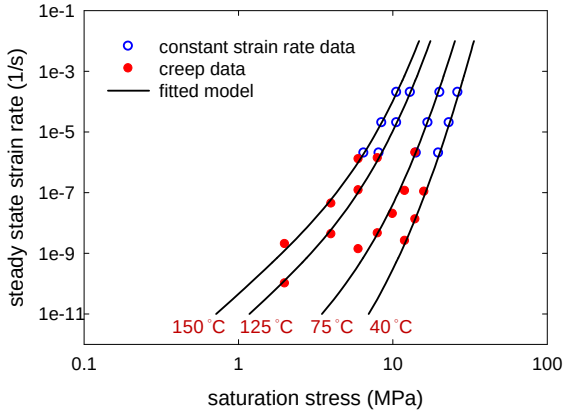
Peak strain evoluation under stress-controlled fatigue experiments

Solder characterization and reliability model

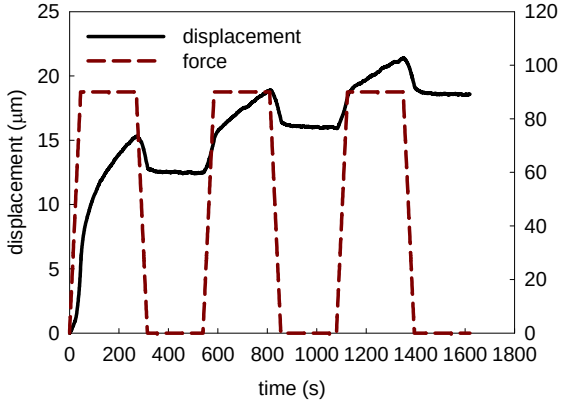
- Viscoplastic behavior characterization and constitutive model
- Finite element model for damage parameter evaluation
- Fatigue response characterization and life prediction model



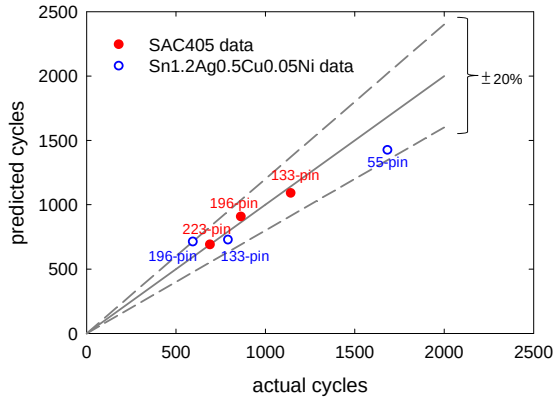
Solder joint cracking under T/C



Pb-free SAC1205 creep response



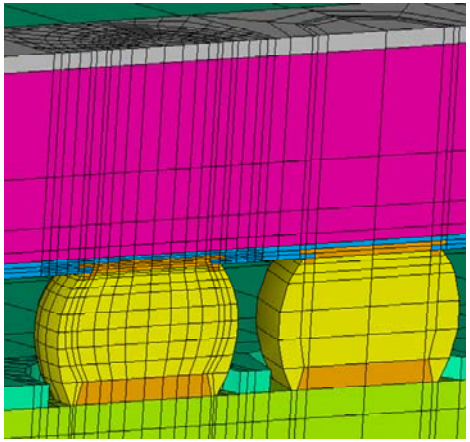
Solder joint response under cyclic shear



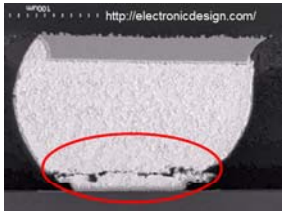
Model-experiment correlation

Design optimization for IC package reliability

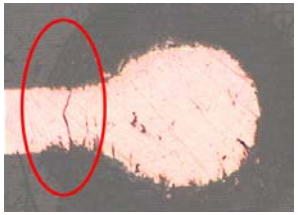
- Simulation based design optimization
- Damage responses modeled by response surface method, ANN, or FE-direct calculation
- Optimization based on multiple failure mechanisms by using GA, RBDO, or SORA

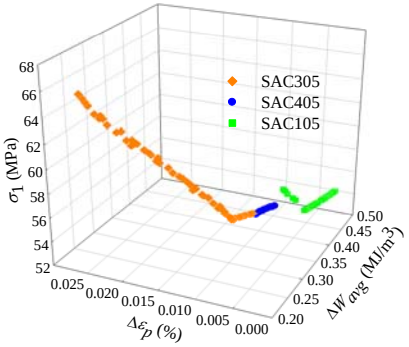


Solder joint crack

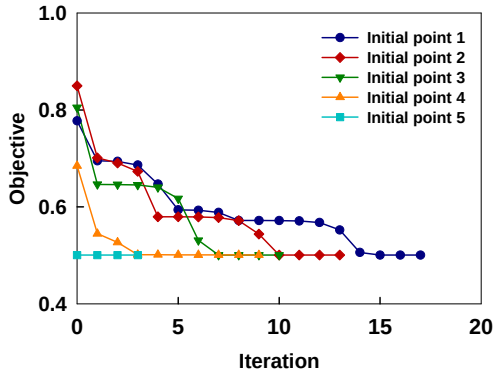


Cu trace crack





Pareto-optimal solutions by MOGA



damage parameter optimization by SORA

Bone screw and plate designs

- Bone screw and plate design
  - For fracture healing
  - Essential requirements: Proper fixation, variable screw angle , anti-cold welding
- Application of metal 3D printing
  - Complex geometry design enabled by 3D printing
  - Functionally graded metal density for fixation load control