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### Strain Localization Analysis

**Title**: Using a Large Strain Self-Consistent Approach

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#### Context of the Study

**Plastic Anisotropy Evolution**

- Textural anisotropy (crystallographic network + morphology)
- Structural anisotropy (intragranular microstructure)

**Forming Limit Diagram (FLD)**

- Plasticity
- Elastic-plastic modulus
- Elastic-plastic tangent modulus
- Plasticity
- Elastic-plastic modulus
- Elastic-plastic tangent modulus

**Mechanisms of Ductility Loss**

- Plastic mechanisms of ductility loss
- Damage mechanisms of ductility loss

#### Aims of the Study

- Ductility loss prediction for forming limits and sequential strain paths
- Optimization of microstructural properties for the sheet forming steels

- Scales transitions tools, micromechanics of plasticity, localisation and damage criteria, coupling with finite elements

- Three main steps:
  - Single crystal modeling,
  - Scale transition,
  - Ductility loss criterion

- Take metallurgy, microstructures, and textures into account

#### Single Crystal Modeling

- **Mesoscopic scale - basic slip process**
- **Microscopic scale - intragranular microstructure**

#### Scale Transition

- Stress-strain relation
- Volume average
- Fourth order localization tensors
- Relation between A and B

- Field equations
- Boundary conditions
- Ellipticity loss

#### Ductility Loss Criterion

- Assumption: the onset of localization is along a band

- Reproduces correctly the intragranular microstructure during monotonic and sequential loading paths

- Gives better results concerning macroscopic behavior during changing loading paths than model without intragranular modeling

#### Conclusions

- Reproduces correctly the shape and the level of direct FLD for mild steel and dual phase

- Reproduces the strain-path dependence of complex FLD