

High Performance Computation-based Phase Field Simulation of Metal Layer Retraction

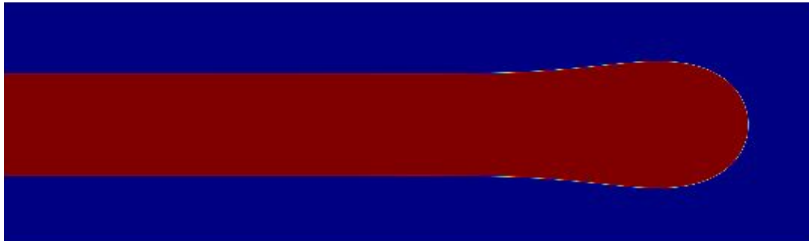
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Content

- 2D simulation of metal layer retraction
 - Annealing + retracting
 - Retracting + breaking
 - Layers jointing
- 3D simulation of metal layer retraction
 - Influence of surface perturbation on layer retraction
 - Influence of surface perturbation on cylinder evolution

2D simulation of layer retraction

- Proposed a simple inferring approach of constant mobility in the Cahn-Hilliard equation by carrying out a series of 2D phase-field modeling of metal layer retraction (*annealing + retracting*).



Numerical model:

Model size: ranges from 40,000 to 4M nodes.

Configuration of HPC machine:

Cluster: Ada (TAMU HPRC)

CPUs: 20-core (GPU-enabled)

Memory: 54G Memory

Software: Matlab (not parallel)

2D simulation of layer retraction

- Proposed a simple inferring approach of composition-dependent mobility in the Cahn-Hilliard equation by carrying out a series of 2D phase-field modeling of metal layer retraction (*retracting+breaking*)



animation

Numerical model:

Model size: 100,000~1M nodes.

Configuration of HPC machine:

Cluster: Terra (TAMU HPRC)

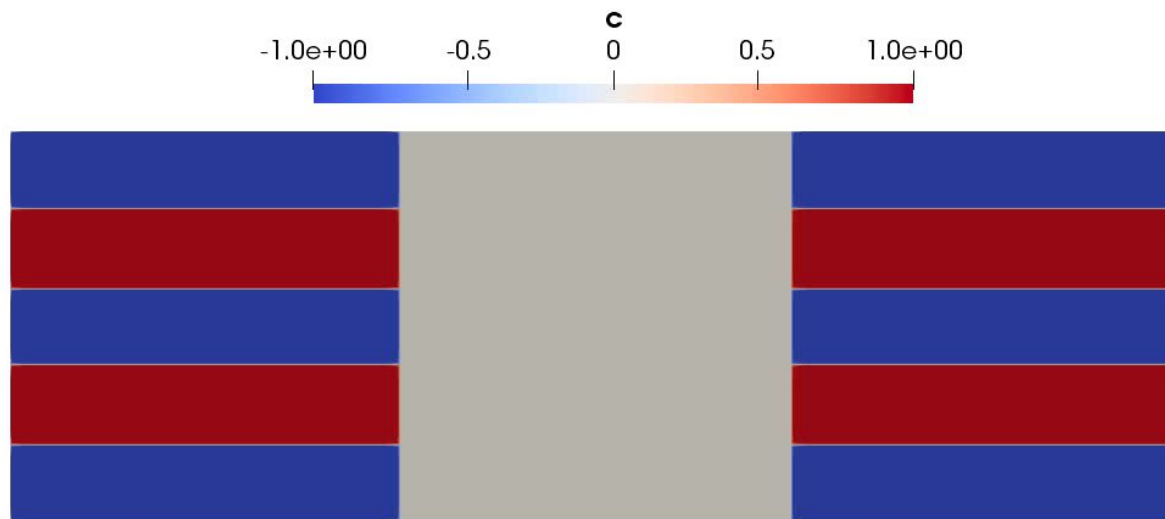
CPUs: 280-core

Memory: 54G Memory

Software: Moose & Paraview

2D simulation of layer retraction

- Simulated the layers jointing process during processing of material via 2D phase-field modeling.



animation

Configuration of HPC machine:

Cluster: Terra (TAMU HPRC)

CPUs: 140-core

Memory: 54G Memory

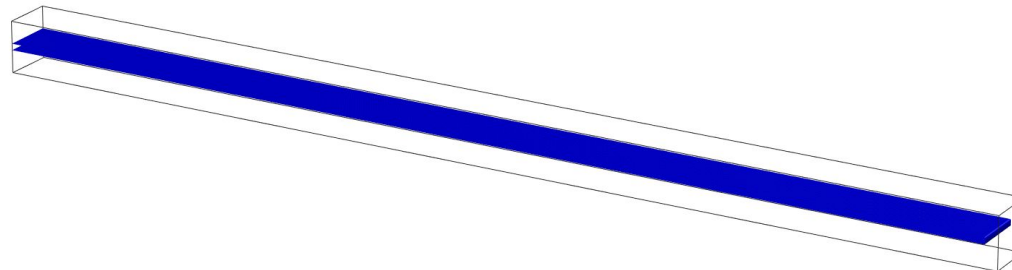
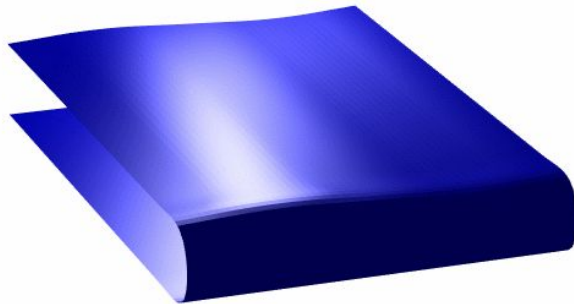
Software: Moose & Paraview

Numerical model:

Mesh resolution: 80,000 nodes.

3D simulation of layer retraction

- Investigated the influence of *surface perturbation* on the retracting process of metal layer by performing 3D phase-field modeling (retracting&breaking)



~4M

Configuration of HPC machine:

Cluster: Terra (TAMU HPRC)

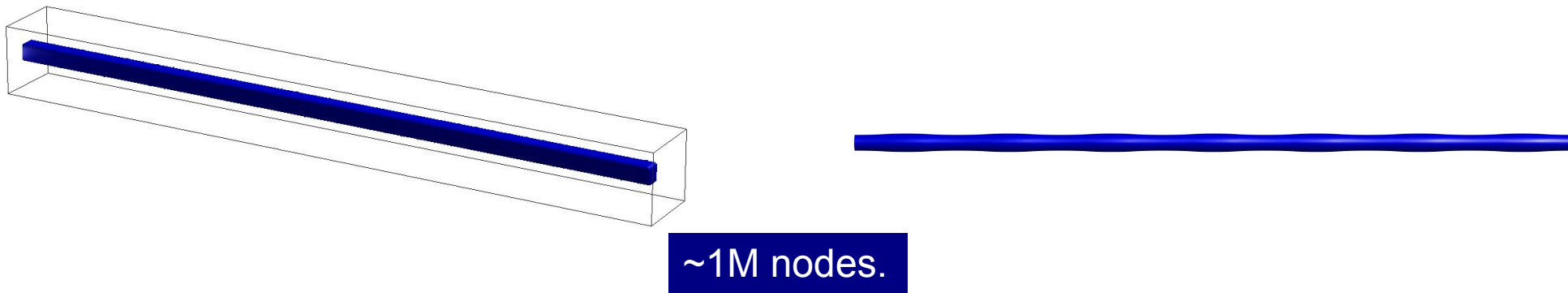
CPUs: 280-core

Memory: 108 G Memory

Software: Moose & Paraview

3D simulation of cylinder's break-up

- Studied the *retraction of cylinders* & the '*Plateau-Rayleigh instability*' of disturbed infinitely long cylinders via 3D phase-field modeling.



Configuration of HPC machine:

Cluster: Terra (TAMU HPRC)

CPUs: 280-core

Memory: 54 G Memory

Software: Moose & Paraview

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Thanks for your attention!

Please feel free to contact me per any questions:

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