Interfaces and Reactive Flow

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http://t14web.lanl.gov/Staff/rsm/Talks/InterfaceReactiveFlow.pdf

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Background

LANL HE applications

- Solid explosives
  Plastic-bonded explosives
- Reactive flow

  $$\left.\begin{array}{l}\text{Euler equations}\\ +\ \text{Rate equation}\end{array}\right\}\text{coupled thru pressure, } P(V,e,\lambda)$$

  Explosive EOS
  – PT equilibrium of reactants and products
- Burn models
  Reaction rate
- Mesoscale simulations
  Reaction rate

Shock-to-Detonation Transition

Hot spot from pore collapse

- Micro-jetting
  Shock sweeps over pore
- Temperature distribution
  After pore collapse

Interface Issues

Numerical gotcha

- Entropy error
  Shock impedance match
- Stationary burn front
  Advecting hot spot on Eulerian mesh
- Mixed cell with PT equilibrium
  Egregious example
- Advection of transverse velocity
  Conservative schemes
- Deflagration front
  Growth of hot spot