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Project: Phase Change Composite Modeling and Validation
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Sponsor: Office of Naval Research

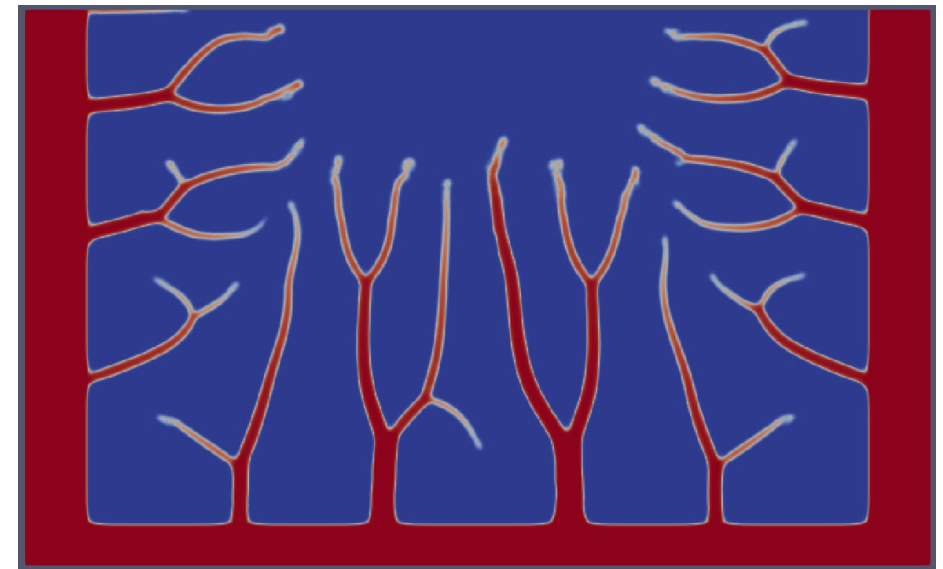


Background



Laboratory for Energy
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- Phase change materials (PCMs) are valuable in thermal energy storage for their high latent heat capacity, but they suffer from low thermal conductivity.
- Adding high conductivity materials to a PCM improves the heat transfer rate but lowers total storage capacity.
- This tradeoff prompts geometric optimization of latent energy storage devices that maximizes storage capacity and heat transfer rate. Considering natural convection in design may yield higher optimums than conduction-based models.



Example of a topology-optimized PCM composite



Project Goals



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- 1) Experimentally validate the performance of topology-optimized composites
- 2) Determine how natural convection influences melting behavior
- 3) Develop a reduced order model that predicts device performance considering natural convection in parallel fin geometries.

