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**Influence of solid structure morphology on convection patterns during solidification** ABHISHEK G.S., SHYAMPRASAD KARAGADDE, Department of Mechanical Engineering, Indian Institute of Technology Bombay, Mumbai, India - 400076 — Solidification experiments and numerical studies were conducted to assess the influence of solidification structures on flow patterns during natural convection. Two transparent organic systems of succinonitrile and salol were chosen for the study. Succinonitrile is known to develop smooth tree-like “dendritic” structures while salol develops sharp hill-like “faceted” solid structures. The first part of the study involved performing experiments to observe the morphology of the solid-liquid interface and estimate its permeability. The second part involved performing numerical simulations using the experimental data to investigate the effect of these structures on the evolution of convection patterns observed during natural convection. Solidification experiments were conducted in a custom in-situ directional solidification cell which allows for imaging the interface real-time through the process of solidification. The images were segmented and a mesh for the solid structure was generated. OpenFOAM was used to perform natural convection simulations on the time-evolving mesh obtained from the experiments to simulate the initiation and development of convection patterns in the bulk liquid. The dendritic system displayed vertical plumes rising amidst the bulk liquid, while the faceted system displayed a random convection pattern. The effect of the characteristic features of the solid structures such as solid fraction and surface area per unit volume on the convection patterns are discussed.

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