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Investigation of Oxygen Transfer Enhancement in Thermally Driven Cavities By Lattice Boltzmann Simulation. HUIDAN YU, CNLS, Los Alamos National Lab, JINSUO ZHANG, D-5, Los Alamos National Lab, NING LI, MST-10, Los Alamos National Lab — We investigate the enhancement of mass transfer in 2D thermally driven cavities using lattice Boltzmann equation (LBE) method. The computational technique integrates three coupled LBEs for solving velocity, temperature, and concentration fields simultaneously. Simulation is performed for oxygen transfer in lead/lead-bismuth eutectic with variations of temperature boundary, Schmidt number, and field aspect ratio to investigate the effects on enhancement of oxygen transfer. Interested characteristics include oxygen concentration, Sherwood number, and velocity profiles, etc. Our results clearly indicate that oxygen transfer is dominated by convection while diffusion also plays a role on it. Comparative studies demonstrate that side heating and top cooling device is more efficient to transfer oxygen than side heating and cooling device and oxygen transfers more rapidly in square cavity than in rectangular cavity. This work establishes a reliable thermal LBE model for thermally driven heat and mass transfer.

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