Effects of Thermo-Solutal Convection during the Crystal Growth Processes of Mercurous Chloride (Hg_2Cl_2)

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The effects of convection on the crystal growth rates of mercurous chloride (Hg_2Cl_2) are investigated for convective-diffusive conditions and purely diffusion conditions achievable in low gravity environments under a nonlinear thermal profile. For 4 ≤ M_B ≤ 472.086, the solute driven convection (solutal Grashof number Gr_s = 1.72 x 10^5) due to the disparity in the molecular weights of the component A (Hg_2Cl_2) and B (argon:Ar) is stronger than the thermally-driven convection (thermal Grashof number Gr_t = 1.05 x 10^4), for an aspect ratio (transport length-to-width) of 5, total pressure of 35,455 Pascal, Pr = 0.667, Le = 0.47, Pe = 3.57, C_v = 1.029.With the temperature humps, there were found to be in undersaturations along the transport path for convective-diffusive processes ranging from D_{AB} = 0.0584 cm^2/s to 0.584 cm^2/s, in axial positions from 0 to 7.5 cm. The diffusion mode is predominant over convection for gravity levels less than 0.1 g_0 for the horizontally-oriented configuration.