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Heat/Fluid Flow Performance of Binary Gas Mixtures Formed with Helium Across Parallel-Plate Channels ANTONIO CAMPO, SREEDHAR MANCHU, University of Vermont — The present study examines the trade-off between heat transfer enhancement and pressure drop increments caused by the flow of laminar binary gases in parallel-plate channels. Helium is the primary gas and carbon dioxide, methane, nitrogen, oxygen and xenon are the secondary gases. From fluid physics, two thermophysical properties: viscosity and density affect the gas flow, whereas four thermophysical properties: viscosity, density, thermal conductivity, and heat capacity at constant pressure influence the forced convection. From physical-chemistry, the collection of four thermophysical properties depends on temperature, pressure and molar gas composition. The simultaneous development of laminar velocity and temperature of each binary gas mixture is predicted using the finite volume method for two Reynolds numbers based on hydraulic diameter, i.e., 1000 and 2000. The two target parameters are the total heat transfer or mean convection coefficient and the pressure drop. The beneficial connectedness of the two target parameters changing with the molar gas composition is reported in terms of a proper figure-of-merit, the heat/fluid flow performance parameter for the two Reynolds numbers.

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