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Numerical investigation of high temperature heat pipe incorporated in thermal energy storage systems MAHBOOBE MAHDAVI, SONGGANG QIU, SAEED TIARI, Sustainable Energy and Energy Efficiency Laboratory, Department of Mechanical Engineering, Temple University, Philadelphia, PA — In the present work, a new type of high temperature heat pipe is investigated which can be incorporated in the thermal energy storage for concentrated solar power systems. A detailed two dimensional axisymmetric numerical procedure is developed to analyze the steady state thermal-hydrodynamic characteristics of the heat pipe. The model accounts for conduction in the wall and wick regions as well as compressible flow in vapor chambers. The geometrical features, working fluid type, wick structure and operational temperature of the heat pipe are adjusted satisfying the heat transport limitations. The proposed numerical model agrees well with available experimental data. The effects of evaporator heat input and vapor core radius on the vapor velocity and pressure fields, vapor and wall temperature distributions as well as heat pipe thermal resistance are studied. The results revealed that the thermal resistance increases with the increase of heat input while decreases with the increase of radius, however, there exists a certain radius which further increase over would not affect the thermal resistance significantly.

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