Numerical Study on the Effects of the Wick Structure of an Annular Heat Pipe on the Isothermal Performance

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Abstract - This paper presents a numerical work on the effect of wick construction on the isothermal performance of an annular heat pipe. Two type connection wick structures were designed, the axial direction connection wick structure and radial direction connection wick structure. A three-dimensional symmetrical model with liquid-vapor phase transition was built. The isothermal performance of the annular part at the front end of the heat pipe was good, the temperature of liquid pool part was about 5-6 K higher than the annular part, and the isothermal performance of axial direction connection wick structure is better than radial direction connection wick structure. The influence of the wick on the vapor flow will affect the vapor temperature distribution, the isothermal surface distribution is obviously the same as the form of the axial direction connection wick at the outlet of the liquid pool, and the isothermal surface will rotate with the axial direction connection wick structure.

Keywords: Annular heat pipe; Three-dimensional model; Liquid-vapor phase transition; Isothermal performance; Potassium.