

工程热物理

环路热管毛细芯热物性实验研究

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摘要: 采用粉末冶金的方法, 使用不同成型压力和不同造孔剂添加量制备了孔隙率为45%~80%的环路热管毛细芯。采用瞬态平面热源法, 研究了毛细芯的导热系数、热扩散系数和单位体积热容。总结得到了热物性参数与孔隙率以及制备这些毛细芯所使用的成型压力和造孔剂添加量之间的关系。结果表明, 随着孔隙率的增大, 导热系数呈现出单调下降的趋势, 但热扩散系数和单位体积热容却与孔隙率的关系并不明显。含水毛细芯的导热系数和单位体积热容均比相同参数下干态的要大, 但热扩散系数的情况却不一样。随着成型压力的增大, 毛细芯的导热系数显著增大, 热扩散系数和单位体积热容变化情况不一。随着造孔剂添加量的增大, 毛细芯的导热系数和单位体积热容显著减小, 热扩散系数明显增大。

关键词: 毛细芯 导热系数 热扩散系数 比热容 瞬态平面热源法

Experimental Study on Thermo Physical Properties of Capillary Wicks for Loop Heat Pipe

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Abstract: Loop heat pipe capillary wicks with porosity in the range of 45%-80% were prepared using different forming pressure and different space-holder addition by powder metallurgy method. Thermal conductivity, thermal diffusivity and volume specific heat were studied using the transient plane source method. The relationships between thermo physical properties and porosity, forming pressure and space-holder addition were investigated. The result shows that thermal conductivity decreases with the increase of porosity, but there are no obvious relationship between thermal diffusivity, volume specific heat and porosity. Both thermal conductivity and volume specific heat of water saturated state capillary wicks are bigger than those of dry state ones, but there is no obvious similar rule for thermal diffusivity. Thermal conductivity increases while there are no obvious changing trends for thermal diffusivity and volume specific heat with the increase of forming pressure. Thermal conductivity and volume specific heat decrease while thermal diffusivity increases with the increase of space-holder addition.

Keywords: capillary wick thermal conductivity thermal diffusivity specific heat transient plane source method

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