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并联硅基扩缩微通道热沉强化传热特性

Heat transfer enhancement characteristics of parallel-microchannel silicon heat sink with expansion-constriction cross sections

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中文关键词： 扩缩 微通道 恒热流 摩擦因数 强化传热

英文关键词:expansion-constriction microchannel constant heat flux friction factor heat transfer enhancement

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中文摘要:

采用去离子水作为冷却工质，实验研究了并联硅基扩缩微通道热沉内的流体流动与强化传热特性.基于微尺度强化传热机理，设计加工了两种并联硅基扩缩微通道热沉.通过测量流体的体积流量、进出口压降与温度、热沉底面加热膜温度，并以传统矩形直通道热沉为参照，获得了并联硅基扩缩微通道热沉在恒热流边界条件和不同体积流量工况下流体流动与对流传热特性参数.结果显示：相对于矩形直通道，并联硅基扩缩微通道热沉的表面传热系数可提高12.5%~85.1%，但摩擦因数只增加了-9.2%~31.4%.表明并联硅基扩缩微通道热沉具有优越的强化传热特性.

英文摘要:

With deionized water as working fluid,experiments on fluid flow and heat transfer enhancement characteristics were conducted in the parallel-microchannel silicon heat sink with expansion-constriction cross sections.Based on the microscale heat transfer enhancement mechanism,two parallel-microchannel silicon heat sink with expansion-constriction cross sections were designed and processed.In contrast to the corresponding conventional rectangular microchannel heat sink,the flow and heat transfer parameters of parallel-microchannel silicon heat sink with expansion-constriction cross sections were obtained in different volume flow rates and constant wall heat flux,along with simultaneous measurement of volume flow rate,pressure drop and temperature in the inlet and outlet,and wall temperature at the substrate of heat sink.It is found that the heat transfer rate of parallel-microchannel silicon heat sink with expansion-constriction cross sections is increased by 12.5%-85.1% over the rectangular straight microchannel heat sink value,but the friction factor is only increased by -9.2%-31.4%,showing that the parallel-microchannel silicon heat sink with expansion-constriction cross sections has superior heat transfer enhancement characteristics.