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A HEAT EXTRACTOR

Abstract

Improvements in performance and multi-functionality of electronic systems are unavoidably accompanied with increment in power dissipation thereof. Typically, forced convection liquid cooling with water, dielectric liquid or the like coolants is utilised for removing the massive amount of heat generated from electronic devices. Micro-channel heat sinks have demonstrated their capability in removing heat generated from high power dissipation. Typical silicon micro-channel heat sinks are typically made through bulk etching technique. However, the micro-channels are featured by bulk removal processes which are time-consuming and expensive. Instead, a foam structure can be used as a cost-effective alternative to the micro-channel heat sink. The highly porous foam structure, made from one of graphite or metallic material, is a good heat dissipating structure. The general porosity of the foam structure is within a range of 0.9 to 0.6. This highly porous structure allows fluid to flow through the structure with reduced flow resistances. The porous structure provides a larger heat exchange area within the same volume compared with the finned heat sinks. However, typical implementations results in high resistance to fluid flow and therefore lower volume flow rate through the foam structure. Lowering the volume flow rate consequently results in a lower rate of heat transfer between the fluid and the foam structure and slower heat removal from the foam structure. Increasing the volume flow rate would require a larger pump for creating a higher pressure-head at the foam structure. The larger pump and higher power requirement is inefficacious when implemented within a portable computing device. Embodiments of the invention, a heat extractor, direct fluid into a foam structure towards a thermal nucleus whereat concentration generated by a heat source is the highest. An impinging flow condition is created within the foam structure whereby heat is effectively conducted by the fluid and subsequently extracted from the foam structure by expelling the fluid therefrom.

Figure 2