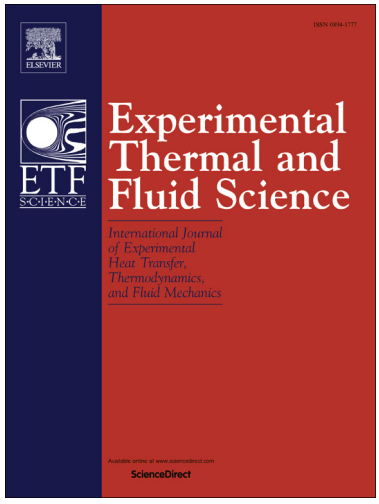

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PII: S0894-1777(17)30005-5
DOI: http://dx.doi.org/10.1016/j.expthermflusci.2017.01.005
Reference: ETF 8984

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 22 July 2016
Revised Date: 30 December 2016
Accepted Date: 5 January 2017

Please cite this article as: Y. Zhai, G. Xia, Z. Li, H. Wang, Experimental investigation and empirical correlations of single and laminar convective heat transfer in microchannel heat sinks, *Experimental Thermal and Fluid Science* (2017), doi: http://dx.doi.org/10.1016/j.expthermflusci.2017.01.005

Experimental investigation and empirical correlations of single and laminar convective heat transfer in microchannel heat sinks

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Abstract: Based on previous studies, related empirical correlations of laminar convective heat transfer in microchannel heat sinks are summed up firstly. They include pressure drop, friction factor, Nusselt number and different thermal resistances, etc. The corresponding experiment and simulation are validated the accuracy of presented empirical model. Deionized water is used as working fluid. The results show that pressure drop and Nusselt number obtained from experiment and simulation are compared with those from empirical correlations, showing good agreement within 10%. Furthermore, different thermal resistances, temperature rise of fluid and flow distribution in microchannel heat sinks are also investigated. Convective thermal resistance plays an important role in the heat transfer process. The portion of it exceeds 50%, thus convective thermal resistance should be reduced to enhance heat transfer. Temperature rise of fluid caused by convective heat transfer is a domain factor. It will decrease with the increase of Reynolds number. Moreover, uniform flow distribution leads to uniform temperature field at the bottom of microchannel heat sinks. In order to eliminate the entrance effect, the length of entrance region should be long enough to obtained uniform flow distribution in parallel-channel heat sinks. The theoretical guidance of convective heat transfer is provided for optimizing design in microchannel heat sinks.

Key words: empirical model, thermal resistance, temperature rise, flow distribution, microchannel heat sink

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