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Pump-Free Composite Nanochannels for Chip-Level Cooling¹ ZHIGANG LI, CHONG LIU, Department of Mechanical Engineering, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong — In this work, we propose a composite nanochannel system, where half of the channel is of low surface energy, while the other half has relatively high surface energy. It is shown that fluids in such channels can be continuously driven by a symmetric temperature gradient. In the low surface energy part, the fluid moves from high to low temperature, while the fluid migrates from low to high temperature in the part of high surface energy. The mechanisms that govern the flow are explained and the conditions required to guarantee the flow and the possible applications are discussed. One advantage about this system is the application for chip-level cooling, where the heat generated in the chip can be used to drive the liquid without using external pumps, which consume energy, occupy space, and therefore conflict with the miniaturization objectives of the next generation electronic devices.

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