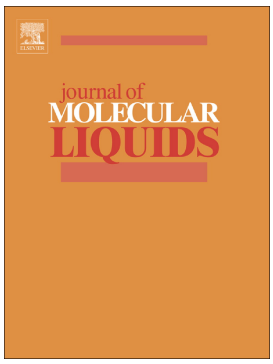

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Efficacy of a hybrid nanofluid in a new microchannel heat sink equipped with both secondary channels and ribs

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Abstract

This paper aims to evaluate the thermohydraulic attributes of a hybrid nanofluid containing graphene–silver nanoparticles in a microchannel heat sink equipped with the ribs and secondary channels. In addition to the heat transfer surface increment, the ribs direct the flow towards the secondary channels, and intensify the flow mixing. Meanwhile, the secondary channels increase the flow area, which reduces the pressure drop due to the presence of the ribs. The results show that combining the three approaches, namely employing the nanofluid, ribs and secondary channels in the microchannel improves the heat sink performance significantly. With increasing either concentration or Reynolds number, the temperature decreases, the temperature uniformity enhances, and the regions with highest temperatures become smaller. Additionally, the average convective heat transfer coefficient enhances with increasing the concentration and Reynolds number such that with increase of the concentration from 0 to 0.1% at Re=100, a 17%