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THERMODYNAMIC AND HYDRODYNAMIC BEHAVIOR OF NANOFLUIDS IN COOLING SYSTEMS

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Abstract

Nanofluids (NF), i.e. fluids embedded with nanostructured materials, have recently became a subject of growing scientific interest due to reports of greatly enhanced thermal properties. The exploitation of NF phenomena will allow to create a new class of efficient working and heat transfer media for wide range of technological application and bring such benefits like energy efficiency (e.g., improving heat transfer, reducing pumping power), lower operating costs, smaller/ lighter systems (small heat exchangers) and cleaner environment (e.g., reducing heat transfer fluid inventory). Constructal theory and design proposed by A. Bejan in the context of optimizing the access to flow between a point and an area with application to cooling of electronics are discussed. Computational method for the evaluation of the transport processes with nanofluids in artificially designed media with desired extreme performances (so-called, constructal media) is developed. The results show that the effectiveness for the flow rates considered was 10 % greater than that of ideal cross flow heat exchanger.