Keynote Talk 01

Computational Modelling of Nanofluids Dynamics and Thermal Decomposition in a Microchannel

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ABSTRACT

Microchannels play an important role in industrial fluid flow and heat transfer devices and are one of the essential parts of micro-machined fluid systems. Microchannels heat exchangers used in both cooling and heating processes are characterized by high heat transfer ratio, low refrigerant charges, compact size, and lower air-side pressure drops. The advent of nanofluids ensuing from nanotechnology has also yields a major improvement in industrial heat transfer processes and cooling technologies. In this presentation, a mathematical model describing the thermal decomposition of nanofluid contains ethylene glycol and water mixture with silver nanoparticles in a microchannel is theoretically examined. The nonlinear problem is tackled semi-analytically via perturbation method with a special type of Hermite-Padé approximation technique. The achieved pertinent results compare excellently well with the one obtained from numerical method based on shooting techniques coupled with Runge-Kutta-Fehlberg integration scheme. The effects of various emerging thermophysical parameters on the overall flow structure and thermal criticality in the flow system are presented graphically and discussed.

Keywords: Microchannel flows; Nanofluids; Thermal criticality; Ethylene glycol and Water Mixture; Hermite-Padé approximation technique.

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