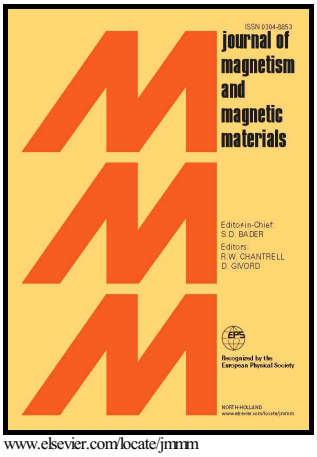

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Streaming potential and heat transfer of nanofluids in microchannels in the presence of magnetic field

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ABSTRACT: In this work, we investigate the heat transfer characteristics of thermally developed nanofluid flow through a parallel plate microchannel under the combined influences of externally applied axial pressure gradient and transverse magnetic fields. The analytical solutions for electromagnetohydrodynamic (EMHD) flow in microchannels are obtained under the Debye–Hückel linearization. The classical boundary condition of uniform wall heat flux is considered in the analysis, and the effect of viscous dissipation as well as Joule heating is also taken into account. In addition, in virtue of the velocity field and temperature field, the Nusselt number variations are induced. The results for pertinent dimensionless parameters are presented graphically and discussed in briefly.

Keywords: Streaming potential; Magnetic field; Nanofluid; Heat transfer; Nusselt number.

1. Introduction

Over the last decade, transport processes pertinent to microfluidics and nanofluidics based lab-on-a-chip have received serious attention due to their wide range of applications, such as in the areas of microelectronics and MEMS, inkjet printing, biomedical separation and diagnostic techniques, microactuators, microsensors and heat exchangers [1-3]. Traditionally, flow manipulation in many fluidic devices is achieved by the application of the pressure gradient.

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