Entropy Generation Analysis for MHD Non-miscible Micropolar and Newtonian Fluid Flow in a Rectangular Porous Channel

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ABSTRACT

The aim of the present work is to examine the entropy production characteristics, thermal profile, and flow behaviour of two non-miscible natures of Newtonian and micropolar fluids, which take place through a rectangular porous enclosure channel. The flow region is divided into two distinct porous zones of the channel and is subjected to a constant oriented magnetic field. The Eringen's micropolar fluid is taking place in the upper porous zone, whereas in the lower porous zone, the Newtonian fluid is flowing. The wall surface of a rectangular porous channel is isothermal, and the flow of immiscible fluid through a porous channel takes place because of a constant pressure gradient. No slip condition is imposed on the static walls and continuity of vorticity, velocity, shear stress component, thermal distribution, and thermal flux are prescribed at the interface. Here, the production of entropy due to fluid friction and thermal exchange for non-miscible Newtonian and micropolar fluids is evaluated. The characteristics of various estimated parameters on thermal and flow properties, such as Bejan number distribution, flow velocity, entropy production, and thermal profile, are discussed. The obtained results show that entropy production is directly proportional to viscous dissipation and Reynolds number, whereas it has a reverse nature with micropolarity parameter, inclination angle parameter, and Hartman number. Our results corroborate with previous published results.

Keywords: Immiscible fluid; Micropolar fluid; Porous media; Entropy generation number.

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