

Magnetohydrodynamic (MHD) Effects on Micropolar-Newtonian Fluid Flow through a Composite Porous Channel

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Abstract : The present study investigates the flow of a Newtonian fluid sandwiched between two rectangular porous channels filled with micropolar fluid in the presence of a uniform magnetic field applied in a direction perpendicular to that of the fluid motion. The governing equations of micropolar fluid are modified by Nowacki's approach. For respective porous channels, expressions for velocity vectors, microrotations, stresses (shear and couple) are obtained analytically. Continuity of velocities, continuities of micro rotations and continuity of stresses are used at the porous interfaces; conditions of no-slip and no spin are applied at the impervious boundaries of the composite channel. Numerical values of flow rate, wall shear stresses and couple stresses at the porous interfaces are calculated for different values of various parameters. Graphs of the flow rate and fluid velocity are plotted and their behaviors are discussed.

Keywords : couple stress, flow rate, Hartmann number, micropolar fluids

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