

VISCOUS DISSIPATION INSTABILITY OF NON-NEWTONIAN FLOW IN A HORIZONTAL POROUS CHANNEL

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ABSTRACT The onset of thermal convection inside a horizontal fluid saturated porous layer is here investigated. The fluid that saturates the porous layer is non-Newtonian and, in particular, it is a power-law fluid. The porous layer is impermeable, the lower boundary is thermally insulated while the upper boundary is isothermal. A horizontal basic flow characterised by uniform velocity and variable direction is imposed. The viscous dissipation contribution is included into the energy balance equation as internal heat source. A linear stability analysis of the basic state is performed employing the normal mode method. The eigenvalue problem obtained is solved numerically for high values of the Péclet number. Neutral stability curves are obtained for transverse, oblique, and longitudinal rolls. Different kind of non-Newtonian fluid are studied. A number of threshold values of the governing parameters for the onset of thermal convection are also reported.