Onset of thermosolutal convection in an Ellis fluid- saturated porous layer

Vinod Y[a]. and Raghunatha K. R[a].

[a]Davangere university, Davanagere, India.

Presented by Vinod Y.

Corresponding author – vinod.vinu.vy@gmail.com

ABSTRACT

The initiation of thermosolutal convective instability is investigated in a horizontal porous layer saturated by a shear-thinning fluid following Ellis' rheology. The porous layer is heated as well as salted from below and a basic horizontal throughflow prompted by the prescribed pressure gradient is considered. The linear stability analysis is performed using normal mode analysis and the threshold conditions for the onset of convection are obtained in a closed form. The imposed horizontal pressure gradient and the solute concentration gradient reinforce together in resulting the onset of convection through oscillatory motions. The transverse rolls are the most unstable which are found to be both travelling and non-travelling in the reference frame comoving with the basic throughflow. The effect of increasing the Ellis power-law index and the solute Darcy-Rayleigh number is to stabilise, while an increase in the Darcy-Ellis number is to destabilise the base flow. The pressure and temperature/solute concentration lines are presented at the critical state. The results delineated under the limiting cases are shown to be in agreement with those published previously.