

Bénard Convection in Anisotropic Porous Cylindrical Enclosure Saturated with Nanofluid

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This paper investigates the onset of convection and heat transfer in a nanofluid suspension within anisotropic porous enclosures of varying heights. The flow dynamics are modeled using the Buongiorno model, which is then non-dimensionalized through appropriate transformations. For linear stability analysis, Bessel functions are employed as eigenfunctions, while double Fourier-Bessel functions are used for weak non-linear stability analysis. The effects of key flow-characterizing parameters on the onset of convection, as well as heat and mass transfer rates, are presented both graphically and in tabular form. Outcomes suggest that convection occurs earlier in shallower cylindrical enclosures, whereas the presence of an anisotropic porous medium delays the onset of convection.

Keywords: Anisotropic porous medium, Cylindrical enclosure, Fourier-Bessel Function, Nanofluid.