World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:13, No:04, 2019

Thermal Instability in Rivlin-Ericksen Elastico-Viscous Nanofluid with Connective Boundary Condition: Effect of Vertical Throughflow

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Abstract : The effect of vertical throughflow on the onset of convection in Rivlin-Ericksen Elastico-Viscous nanofluid with convective boundary condition is investigated. The flow is stimulated with modified Darcy model under the assumption that the nanoparticle volume fraction is not actively managed on the boundaries. The heat conservation equation is formulated by introducing the convective term of nanoparticle flux. A linear stability analysis based upon normal mode is performed, and an approximate solution of eigenvalue problems is obtained using the Galerkin weighted residual method. Investigation of the dependence of the Rayleigh number on various viscous and nanofluid parameter is performed. It is found that through flow and nanofluid parameters hasten the convection while capacity ratio, kinematics viscoelasticity, and Vadasz number do not govern the stationary convection. Using the convective component of nanoparticle flux, critical wave number is the function of nanofluid parameters as well as the throughflow parameter. The obtained solution provides important physical insight into the behavior of this model.

Keywords : Darcy model, nanofluid, porous layer, throughflow
Conference Title : ICM 2019 : International Conference on Mathematics
Conference Location : Paris, France
Conference Dates : April 18-19, 2019