عنوان مقاله:

Effect of Electric field Modulation on the Onset of Electroconvection in a Dielectric Fluid Anisotropic Porous Layer

محل انتشار:

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خلاصه مقاله:

The method of small perturbation coupled with the regular perturbation method is employed to investigate the effect of time-periodic electric field modulation on electroconvection in a densely packed anisotropic porous layer saturated with a Boussinesq dielectric fluid. The Darcy model is adopted to describe the fluid motion and the dielectric constant is assumed to be a linear function of temperature. The regular perturbation method is used to determine the critical correction Rayleigh number for small amplitude electric field modulation. It is shown that electric field modulation frequency, electrical, porosity, and anisotropic parameters are related to the shift in the critical Rayleigh number and that subcritical convective motion is possible for low frequency modulation of the electric field. The classical destabilizing effect of the dielectrophoretic force associated with the unmodulated, anisotropic dielectric fluid porous layer is only realized for low frequency modulation of the electric field. Furthermore, it is substantiated that anisotropic parameters greatly influence the stability criterion for moderate and large values of the frequency of electric field modulation. The study reveals that time-varying electric fields and anisotropic characteristics of the fluid layer may have implications for the control of electroconvection in heat transfer applications involving dielectric fluid as working media.

کلمات کلیدی:

Porosity، Modulation،,,, Electric Field،,,, Dielectric Fluid،,,, Anisotropic porous medium,,,