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Suppression of vortex breakdown and fluid layers formed between coaxial cylinders with magnetic field

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This research aims to investigate the magnetic field effects on the vortex breakdown and fluid layers developed by the rotating flow in vertical annuli filled with an electrically conducting fluid. The governing Navier-Stokes, temperature, and potential equations are solved by using the finite-volume method. For certain combinations of Reynolds number (Re) and aspect ratio (γ), the vortex breakdown bubble occurred near the inner wall. Multiple fluid layers become apparent when the temperature difference exceeds a critical value. These fluid layers play the role of thermal insulation and limit the heat transfer between the hot top and cold bottom of the coaxial cylinders. Both the vortex breakdown and fluid layers could be suppressed by the magnetic field; the increasing of Hartmann number (Ha) would reduce the number of fluid layers. Diagrams represent the effect of increasing Richardson number (Ri) on the formed fluid layers are established. Then stability diagrams corresponding to the transition from the multiple fluid layers zone to the one fluid layer zone for increasing Prandtl number (Pr) are obtained.

Biography

Brahim MAHFOUD has completed his doctorate at the age of 38 years from Constantine University (Algeria) and postdoctoral studies from Constantine University of thechnologie. He is the proffesor of mechanical and energy in Bouira university (Algeria) . He has published more than 50 papers in High Impact Journals and Reviewer in many international journals such as physic and fluid. Courses/ combustion, Radiation heat transfer, Fluid Mechanics