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Analysis of fluid-solid interaction in MHD natural convection in a square cavity equally partitioned by a vertical flexible membrane
(2017) *Journal of Magnetism and Magnetic Materials*, 424, pp. 161-173. Cited 33 times.

Abstract
This paper investigates numerically the problem of unsteady natural convection inside a square cavity partitioned by a flexible impermeable membrane. The finite element method with the arbitrary Lagrangian-Eulerian (ALE) technique has been used to model the interaction of the fluid and the membrane. The horizontal walls of the cavity are kept adiabatic while the vertical walls are kept isothermal at different temperatures. A uniform magnetic field is applied onto the cavity with different orientations. The cavity has been provided by two eyelets to compensate volume changes due the movement of the flexible membrane. A parametric study is carried out for the pertinent parameters, which are the Rayleigh number (105–108), Hartmann number (0–200) and the orientation of the magnetic field (0–180°). The change in the Hartmann number affects the shape of the membrane and the heat transfer in the cavity. The angle of the magnetic field orientation also significantly affects the shape of the membrane and the heat transfer in the cavity. © 2016 Elsevier B.V.

2-s2.0-84991833411
Document Type: Article
Publication Stage: Final
Source: Scopus