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MHD natural convection of Cu–Al 2 O 3 water hybrid nanofluids in a cavity equally divided into two parts by a vertical flexible partition membrane
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Abstract
The aim of the present study is to investigate the effects of a hybrid nanofluid in a square cavity that is divided into two equal parts by a vertical flexible partition in the presence of a magnetic field. A numerical method called the Galerkin finite element method is utilized to solve the governing equations. The effects of different parameters, namely the Rayleigh number (10 6 ≤ Ra ≤ 10 8) and the Hartmann number (0.0 ≤ Ha ≤ 200) as well as the effects of nanoparticles concentration (0.0 ≤ φ ≤ 0.02) and magnetic field orientation (0 ≤ γ ≤ π), on the flow and heat transfer fields for the cases of pure fluid, nanofluid and hybrid nanofluid are investigated. The results indicate that the streamline patterns change remarkably and the convective heat transfer augments with increasing values of the Rayleigh number. Additionally, the maximum stress imposed on the flexible partition resulting from the interaction of the partition and pure fluid is more than those caused by the nanofluid and the hybrid nanofluid. Furthermore, the increase in the magnetic field strength decreases the fluid velocity in the cavity, which declines the fluid thermal mixing and heat transfer effects. © 2019, Akadémiai Kiadó, Budapest, Hungary.

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