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Hall effects on MHD squeezing flow of a water-based nanofluid between two parallel disks
(2019) *Journal of Porous Media*, 22 (2), pp. 209-223. Cited 2 times.

Abstract
The flow squeezed between parallel flat plates that are placed horizontally in nonporous media is of great interest because of its uses in many industries and engineering applications. In light of this fact, we have considered the magnetohydrodynamic (MHD) squeezing flow of a water-based nanofluid through a saturated porous medium between two parallel disks, taking the Hall current into account. The governing equations are solved by the Galerkin optimal homotopy asymptotic method. The effects of nondimensional parameters on velocity, temperature, and concentration have been discussed with the help of graphs. Also, representative numerical solutions for the local Nusselt number and the local Sherwood number are obtained, presented, and discussed. The behaviors of key parameters such as suction/blowing, squeeze, Hartman number, Hall parameter, Brownian motion, and thermophoresis are thoroughly examined. A great impact on the concentration field is observed for the suction flow when compared with the blowing case. The Brownian motion and thermophoresis effects result in an appreciable increase in the temperature and nanoparticles concentration. For both suction and blowing, the temperature and concentration distributions increase monotonically as the suction or blowing parameter increases. The axial velocity increases near the central axis of the channel but decreases near the walls. Under certain assumptions, the present results are compared with already existing ones in the literature and they are found to be in good agreement. © 2019 by Begell House, Inc.

2-s2.0-85063889504
Document Type: Article
Publication Stage: Final
Source: Scopus