Magnetohydrodynamic Micropolar Fluid Squeeze Film Lubrication between Stepped Porous Parallel Plates

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ABSTRACT

Objectives: The primary goal of this paper is to study the influence of MHD and micropolar fluid on the squeeze film lubrication between stepped porous parallel plates.

Method: The non-Newtonian micropolar fluid MHD Reynolds type equation is derived by considering the flow of micropolar fluid in the porous matrix as described by Darcy's law, as well as microstructure additives and magnetic effects associated with the magnetization of the fluid. The numerical solutions are presented graphically for the MHD squeeze film characteristics for various values of coupling number parameter, characteristic material length, and magnetic Hartmann number.

Findings: According to the results, the micropolar fluid and the magnetic effects significantly influence the squeeze film characteristics. Comparing the MHD micropolar fluid impact on the squeeze film lubrication with the corresponding Newtonian and non-magnetic cases, we observe that there is a significant increase in the approaching time and the load-carrying capability. The increase in the step height decreases the squeezing film time. Novelty: The original research was conducted on the magneto-hydrodynamic micropolar fluid squeeze film lubrication between stepped porous parallel plates which has not been studied so far.

Keywords: Squeeze Film, Stepped plates, Magneto-hydrodynamic, Porous, Micropolar.

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