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Analytical and numerical solution of three-dimensional channel flow in presence of a sinusoidal fluid injection and a chemical reaction
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Abstract

Modeling of three-dimensional channel flow in a chemically-reacting fluid between two long vertical parallel flat plates in the presence of a transverse magnetic field is presented. The stationary plate is subjected to a transverse sinusoidal injection velocity distribution while the uniformly moving plate is subjected to a constant suction and slip boundary conditions. Due to this type of injection velocity, the flow becomes three dimensional. Comparisons with previously published work are performed and the results are found to be in excellent agreement. An increase in the permeability/magnetic parameter is found to escalate the velocity near the plate in motion. Growing Reynolds number or magnetic parameter enhances the x-component and reduces the z-component of the skin-friction at the wall at rest. The acquired knowledge in our study can be used by designers to control MHD flow as suitable for certain applications which include laminar magneto-aerodynamics, materials processing and MHD propulsion thermo-fluid dynamics.

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