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Raza, J., Mebarek-Oudina, F., Chamkha, A.J.

Magnetohydrodynamic flow of molybdenum disulfide nanofluid in a channel with shape effects
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Abstract
Purpose: The purpose of this paper is to examine the combined effects of thermal radiation and magnetic field of molybdenum disulfide nanofluid in a channel with changing walls. Water is considered as a Newtonian fluid and treated as a base fluid and MoS2 as nanoparticles with different shapes (spherical, cylindrical and laminar). The main structures of partial differential equations are taken in the form of continuity, momentum and energy equations. Design/methodology/approach: The governing partial differential equations are converted into a set of nonlinear ordinary differential equations by applying a suitable similarity transformation and then solved numerically via a three-stage Lobatto III-A formula. Findings: All obtained unknown functions are discussed in detail after plotting the numerical results against different arising physical parameters. The validations of numerical results have been taken into account with other works reported in literature and are found to be in an excellent agreement. The study reveals that the Nusselt number increases by increasing the solid volume fraction for different shapes of nanoparticles, and an increase in the values of wall expansion ratio α increases the velocity profile f′(η) from lower wall to the center of the channel and decreases afterwards. Originality/value: In this paper, a numerical method was utilized to investigate the influence of molybdenum disulfide (MoS2) nanoparticles shapes on MHD flow of nanofluid in a channel. The validity of the literature review cited above ensures that the current study has never been reported before and it is quite new; therefore, in case of validity of the results, a three-stage Lobattoo III-A formula is implemented in Matlab 15 by built in routine “bvp4c,” and it is found to be in an excellent agreement with the literature published before. © 2019, Emerald Publishing Limited.

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