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EFFECTS OF LUBRICATED SURFACE IN THE STAGNATION POINT FLOW OF A MICROPOLAR FLUID

(Kesan Permukaan Dilicinkan Terhadap Aliran Titik Genangan dalam Bendalir Mikrokutub)

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ABSTRACT

In this investigation, we have considered a steady, two-dimensional flow of a micropolar fluid towards a stagnation point over a lubricated plate. A power law fluid is utilized for the purpose of lubrication. To derive the slip condition in the present flow situation, continuity of shear stress and velocity has been imposed at the fluid lubricant interface. The set of nonlinear coupled ordinary differential equations subject to boundary conditions is solved by a powerful numerical technique called the Keller-box method. Some important flow features have been analyzed and discussed under the influence of slip parameter λ, material parameter K and ratio of micro-rotation to the skin friction parameter n. The main purpose of the present article is to analyze the reduction in the shear stress and couple stress effects in the presence of lubrication as compared to the viscous fluid that may be beneficial during polymeric processing.

Keywords: power law lubricant; stagnation point flow; interfacial condition; micropolar fluid; Keller-box method

ABSTRAK

Dalam kajian ini, aliran mantap dua matra bendalir mikrokutub terhadap plat dilicinkan dipertimbangkan. Bendalir hukum kuasa digunakan bagi tujuan pelinciran. Untuk memperoleh syarat gelincir bagi keadaan aliran ini, keselanjaran tegasan ricih dan halaju dikenakan pada antara-muka bendalir pelincir. Set persamaan pembezaan biasa tertakluk kepada syarat sempadan diselesaikan secara berangka menggunakan kaedah kotak-Keller. Beberapa ciri aliran yang penting dianalisis dan dibincangkan di bawah pengaruh parameter gelincir λ, parameter bahan K dan nisbah mikro putaran terhadap parameter geseran kulit n. Tujuan utama artikel ini adalah untuk menganalisis kesan pengurangan tegasan ricih dan tegasan gandingan dengan kehadiran pelincir berbanding dengan bendalir likat yang boleh memberi manfaat semasa pemprosesan polimer.

Kata kunci: pelincir hukum kuasa; aliran titik genangan; keadaan antara muka; bendalir mikrokutub; kaedah kotak-Keller

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