Elsevier

Journal of the Taiwan Institute of Chemical Engineers

https://doi.org/10.1016/j.jtice.2019.04.052

Heat Irreversibiility Analysis for a Couple Stress Fluid Flow in an Inclined Channel with Isothermal Boundaries

Samuel O. Adesanya , Basma Souayeh , Mohammad Rahimi-Gorji , M.N. Khan, O.G. Adeyemi

Abstract: Entropy generation in a fully developed couple stress fluid flow through an inclined channel is the focus of the present article. The steady flow of the non-Newtonian fluid via the inclined channel is assumed to be heated isothermally at the boundaries. The formulation of both the fluid flow and heat are based on hydrodynamics and thermodynamics laws. Exact solutions are constructed the dimensionless governing equations. The accuracy of the two solutions are established by direct comparison with the limiting case previously obtained in the current literature. Solution profiles are also presented to demonstrate the effect of variations in the parameter values followed closely by extensive discussions.

Keywords: Isothermal heating, Couple stresses, Second law, Inclined channel