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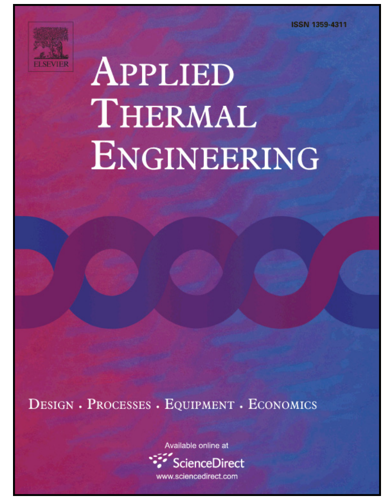

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Entropy generation analysis of a confined slot impinging jet in a converging channel for a shear thinning nanofluid

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Abstract

In this article, numerical investigation of entropy generation due to heat transfer and fluid fiction is performed on a confined slot impinging jet. The non-Newtonian nanofluid is an aqueous solution of 0.5 wt.%. carboxymethyl cellulose (CMC) with *10 nm* diameter TiO_2 nanoparticles. Two-dimensional laminar flow is considered and a constant temperature is applied on the impingement surface. The nanofluid, as well as the base fluid, exhibits pseudoplastic behavior. The thermal and rheological properties of the base fluid and nanofluid are temperature-dependent. In this paper, correlations for the power law and consistency indices, as well as thermal conductivity, as a function of temperature of the fluid based on some existing experimental data in the literature are developed. In order to consider the effect of converging angle and groove amplitude on entropy generation in the channel, the numerical simulation is performed for different converging angles between *0–5°* and groove amplitudes in the range of *0–0.007 m*. The results showed that a large portion of entropy generation is concentrated in the impingement surface. The total entropy generation increases with increasing volume fraction and converging angle. The minimum value of exergy loss tends to occur at higher converging angles by increasing the Reynolds number and jet- impingement surface to distance ratio. Also, the exergy loss decreases with the concave groove amplitudes.

Keywords: Entropy generation, Jet- impingement surface to distance ratio (*H/W*), Groove amplitude, Converging angle, Non-Newtonian

1. Introduction

All fluid flow and heat transfer processes are subject to changes that are irreversible and are mainly caused by energy losses during the processes according to the Second Law of Thermodynamics. Such effects cannot be completely ignored from the system, which leads to a loss of energy. In

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