

Force Convection Heat Transfer Of Al₂O₃ Nanofluids For Different Based Ratio Of Water: Ethylene Glycol Mixture

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ABSTRACT

Nanofluids are developed to meet the challenges of improving the efficiency of the cooling system subsequently minimizing the energy waste. This paper aims to investigate the forced convection heat transfer for Al₂O₃ nanofluids in different based ratio of water (W) and ethylene glycol (EG) mixture. The Al₂O₃ nanofluids are formulated using the two-step method for three based mixture ratio of 60:40, 50:50 and 40:60 (W:EG) by volume. The forced convection experiments are conducted under constant heat flux conditions for operating temperatures of 30–70 °C and Reynolds numbers of 3000–25,000. The heat transfer coefficient of nanofluids is enhanced with concentration compare to its base fluid at all designated temperature. It is observed to be improved further with the increase of temperature. The effect of different base mixture ratio display that nanofluids in 60:40 base mixture have the highest percentage of performance with 24.6% enhancement at 1.0% concentration and temperature of 70 °C. The increment of concentration for nanofluids shows a slight rise in friction factor. As a conclusion, the thermo-physical properties and the forced convection heat transfer for nanofluids in various base mixture is significantly influenced by concentration, temperature and base ratio of mixture.

Keywords: Heat transfer; Friction factor; Nanofluids; Water-ethylene glycol mixture; Based ratio

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