

Turbulent forced convection heat transfer of nanofluids with twisted tape insert in a plain tube

W.H.Azmi, K.V.Sharma, Rizalman Mamat, and Shahrani Anuar

^aFaculty of Mechanical Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

^bDepartment of Mechanical Engineering, University Technology Petronas, Bandar Seri Iskandar, 31750 Tronoh, Perak, Malaysia

Abstract

Experimental determination of heat transfer coefficients of SiO₂/water and TiO₂ /water nanofluid up to 3% volume concentration flowing in a circular tube is undertaken. The investigations are conducted in the Reynolds number range of 5000 to 25000 at a bulk temperature of 30°C. The experiments are undertaken for flow in a circular tube with twisted tapes of different twist ratios in the range of 5 H/D⁹³. The heat transfer enhancement is inversely increased with twist ratio. The heat transfer coefficient of SiO₂/water nanofluid at 3.0% volume concentration is 27.9% higher than water flow for the same twist ratio of five. However, the value of heat transfer coefficient of TiO₂/water nanofluid evaluated at the same concentration is 11.4% greater than water for twist ratio five. Regression equations for Nusselt number estimation are developed valid for water and nano fluid flow with twisted tape inserts under turbulent flow conditions

Keywords : forced convection; heat transfer coefficient; nanofluid; Nusselt number; twisted tape

doi: 10.1016/j.egypro.2014.07.081