



Reliability aspects of TiO₂ nano fluid coolants in Copper micro heat exchangers

D.R.S.Raghuraman^{1*}, PK.Nagarajan², B.V.A.Rao³

¹School of Mechanical and Building Sciences, VIT University, Vellore, India

²Mechanical Engineering Department, S.A. Engineering College, Chennai, India

³Visiting Professor, School of Mechanical and Building Sciences, VIT University, Vellore, India

Abstract: An experimental setup was developed to study the enhancement in heat removal and liquid flow in rectangular copper microheat exchangers with a hydraulic diameter of 29.4 μ m. The liquids used were de-ionized water and TiO₂-de-ionized water based nano fluids. Since the nano liquids with small volume concentrations of 0.1%, 0.3% etc. have been used, the reliability and life of the nanoliquids are discussed in the work. The liquids when used with the nanopowders dissolved in it exhibited stable liquid flows when used for a period of time ranging from 4-5 hours while collecting data for both the concentrations. The nanofluid exhibited instability characteristics (like deposition of nanopowder at the bottom of the vessel after return collection of liquid after the above mentioned time). Also the higher heat release at a temperature of 50-52 C, from the simulated electronic ICs (i.e. the heater) also has resulted in instability of the liquid.

Since the varying flows of the liquid were continually returning to the tank blockages or obstacles to the flow caused by the clustering of particles would be less as compared to other nano liquids and higher viscosity liquids like oils. The flows being laminar, volume concentrations of the nanopowder being less, erosion of the channels was not observed. Other researchers have observed erosion in Cu micro channels when using Al₂O₃ nanoliquids.

Keywords : Micro heat exchangers, Nanofluid, fluid flow, instability, erosion.

D.R.S.Raghuraman *et al* /International Journal of ChemTech Research, 2017,10(6): 215-219.
