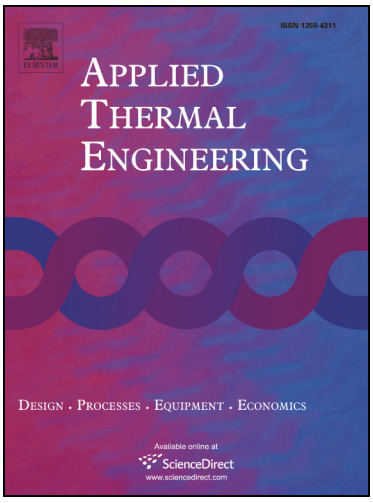

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Abstract: At present, heat transfer phenomena in the microscale and nanoscale systems have been strongly highlighted in the engineering applications of MEMS, NEMS, IC and IT. Since the electronic devices used in such applications involve a considerable amounts of heat generation in a service, a new type of cooling technology should be considered for the proper operation of them. In this study, the heat transfer coefficients of nanofluid, which is the mixture of nanosized alumina (Al_2O_3) particles and water, were studied with small copper tubes of three different sizes (0.8 mm, 1.6 mm and 2.0 mm) to identify the heat transfer coefficients according to the Reynolds number and the concentrations of alumina. For the even dispersion of the nanoparticles in the base liquid, ultrasound excitation was applied for 3.0 hr and the degrees of nanoparticle dispersion with alumina concentrations were measured by using UV-VIS spectrophotometer. Additionally, the thermal conductivities of the nanofluids and the base fluid were measured by the transient hot-wire method. As the Al_2O_3 concentration of nanofluid was increased, it was confirmed that the thermal conductivity was also increased. According to the results of the heat transfer coefficient measurement, the heat transfer coefficient was increased as the Reynolds number or Al_2O_3 concentration was increased, and as the tube diameter gets smaller. When reducing the tube diameter at a constant flowrate, it was shown that the heat transfer coefficient was considerably increased. In the experimental ranges, the heat transfer coefficient at 0.8 mm diameter was averagely about 160 % higher compared to 2.0 mm diameter at the Reynolds number of 1588

Keywords: Heat transfer coefficient; Nanofluids; Nanoparticle; Reynolds number; Thermal conductivity