

Flow Boiling Heat Transfer Characteristics in Horizontal Minichannels with R-410A

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Two-phase flow boiling heat transfer in horizontal small tubes with R-410A is reported in the present experimental study. The test sections, which were made of stainless steel tubes with inner diameters of 0.5 and 3.0 mm, and lengths of 330 and 3000 mm, respectively, were heated uniformly by applying direct electric current to the tubes. The local heat transfer coefficients were obtained over a heat flux range of 5 to 40 kW/m², a mass flux range of 170 to 600 kg/(m²s), a saturation temperature range of 3 to 10 °C, and quality up to 1.0. The effects on heat transfer coefficients caused by mass flux, heat flux and inner tube diameters are presented. The experimental heat transfer coefficient is compared with six existing heat transfer coefficient correlations. A new boiling heat transfer coefficient correlation based on the superposition model for R-410A in small tubes was developed with a mean deviation of 10.31 %.