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The dependence of Nusselt number on Reynolds number for a hot-wire sensor in supercritical CO_2 flow[1] PETAR VUKOSLAVCEVIC, Univ. of Montenegro, JAMES WALLACE, Univ. of Maryland — An analysis of the heat transfer mechanism around a hot-wire sensor in superctitical CO_2 flow has been performed, and the dependence of the Nusselt number (N_u) on the Reynolds number (R_e) has been determined. A special, closed flow loop, capable of inducing variable speed flow at different pressures and temperatures in the ranges of 0.15-2 m/s, 15-70°C and 1-100 bar, has been used to create a supercritical CO_2 flow around a hot-wire sensor operated in the constant temperature mode. The N_u and R_e numbers were determined based on the known heat convected from the sensor, the flow speed and the sensor temperature and dimensions. The experiment was performed along a line of constant 80 bar pressure in the temperature range of 25-65°C. It was found that, at a given pressure and temperature, the relation N_u=F(R_e) has the classical form N_u=M+NR_e^n, with the parameters M and N being functions of pressure and temperature. The dependence of these parameters on temperature was analyzed, and the most convenient reference temperature was chosen. In contrast to the operation of hot-wires in air and water, the dependence of the parameters M and N on the Prandtl number can result in nonunique solutions.

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James Wallace
University of Maryland

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