Study on the Isochoric Specific Heat Capacity of Liquid R32 and R410a

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Recently, refrigerant substances found in nature have attracted renewed attention, due to their mild impact on the environment. Hydrocarbons and their mixtures, or mixtures with hydrofluorocarbons (HFCs), are considered to be leading candidates for alternative refrigerants, because they have zero ozone depletion potential (ODP) values and negligible global warming potential (GWP) values. Reliable equations of state for these working fluids are necessary, in order to evaluate the cycle performance of refrigeration systems using these fluids.

In order to develop a reliable equation of state for a fluid, various thermodynamic property measurements of the fluid are required. Among them, isochoric heat capacity (c_v) measurements in the liquid phase provide a very useful check for calculations of the second derivative of the pressure with respect to temperature, which is information essential to develop but challenging to measure accurately. For propane in the compressed liquid phase, several measurements have been reported.

In this work, the measured c_v values for R32 and 51.1 mass % R32, 48.9 mass % R125 mixtures are examined. The measurements were carried out in a temperature range from 270 to 390 K, and at pressures up to 30 MPa. The measured data are carefully compared with data reported by other researchers. Also, the measured c_v values are compared with reliable equations of state.