Reliable thermophysical-property calculation for refrigerants R32, R125, R134a, R143a, R152a, R410A, and hydrocarbons having theoretical background

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Reliable calculation of thermodynamic properties from the equations of state for important refrigerants of R32[1], R125[2], R134a[3], R143a[4], R152a[5], R410 (a mixture of R32 and R125)[4], and hydrocarbons of normal butane and iso-butane[4] are introduced. The equations of state were recently developed on the basis of not only accurate experimental data but also the theoretical approach from the intermolecular potential model. The reliability of the intermolecular model was confirmed by determining independently from two different accurate experimental data regarding the speed of sound and the PVT properties in the gaseous phase. The reliability of the intermolecular potential model was also confirmed by deriving both the thermodynamic properties and gaseous viscosity from the common intermolecular potential model having the same parameter values[6] with a new temperature correction parameter proposed by Kojima and Sato. In addition to the experimental and the physical background, a genetic algorithm for selecting appropriate terms of the equations of state has also been developed and the behavior of the ideal curves were calculated to confirm the physical feasibility of derived thermodynamic surface even in the range where no experimental data are available at higher temperatures and pressures[1-5]. The recent comprehensive approach to derive reliable thermophysical properties performed in a collaborative study of Keio University and Institute of Technology Bandung will be introduced and summarized.