Surface Tension of Normal Alkanes C9 - C24 Over a Temperature Range from the Triple Point to 573 K

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Many engineering applications in the chemical process industry, such as the mass-transfer operations like distillation, extraction and absorption require surface tension data. The petroleum industry is especially interested in the surface tension of the *n*-alkanes. In this work the new data for the capillary constant of normal alkanes n-C_9H_{20} – n-$C_{24}H_{50}$ in the temperature range from the triple point to 573 K were determined by the differential capillary rise method. Methods for calculating the density of the saturated liquid and gas phases of n-alkanes in the specified temperature range have been analyzed. Based on the most reliable data on the density of coexisting phases and the experimental values of the capillary constant, the surface tension of the investigated n-alkanes was calculated. The expanded uncertainties for surface tension with a confidence level of 95 % are estimated to be 0,5 % near the triple point and 0,8 – 1,0 % at temperature 573 K. Various methods for calculating the surface tension of hydrocarbons have been considered. In this work, the thermodynamic theory of similarity and a scaled theory of critical phenomena are used to predict the surface tension of the investigated n-alkanes over a temperature range from the triple point to critical point. Comparisons of the proposed model with the new experimental data and other available predictive methods are presented.