Vapor Pressures of Normal Alkanes C_8, C_{10}, C_{12}, C_{14} Down to Their Triple Points

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Despite the number of experimental and theoretical studies performed for *n*-alkanes, some of their thermodynamic properties are not well established and their determinations can present various challenges, for example due to a complex polymorphic behavior in the crystalline phase or complex conformational behavior in the gas phase. A general correlation for vapor pressures of *n*-alkane series was developed several times in the last 30 years (Ambrose and Walton 1989, Růžička and Majer 1994, Lemmon and Goodwin 2000, REFPROP23 by NIST). After a closer inspection, all of the correlations are uniformly based on a small number of experimental determinations for each compound in the medium- and high-pressure region. Some of the correlations are not developed using a multi-property correlation, so the correct description of the related thermal properties is not guaranteed. Those that employ such a method suffer from the fact that there were not any experimental or reliable theoretical ideal-gas thermodynamic data available until recently, but only those based on estimations or correlation schemes. Consequently, all the correlations for octane, decane, dodecane, and tetradecane are identical above 1 kPa, but start to deviate around 0.1 kPa and reach a difference of 10 % at their triple point temperatures. Such inconsistency was probably acceptable in the past, but should be reconciled with the experimental and theoretical tools available nowadays. We present a series of low-uncertainty vapor pressure measurements using two static method apparatus that significantly improve the situation in the low-pressure region. Combining the new vapor pressure data and recently presented ideal-gas heat capacities calculated using the R1SM model, we are able to apply the simultaneous correlation method do develop new vapor pressure correlations valid down to the triple points of the studied *n*-alkanes.

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