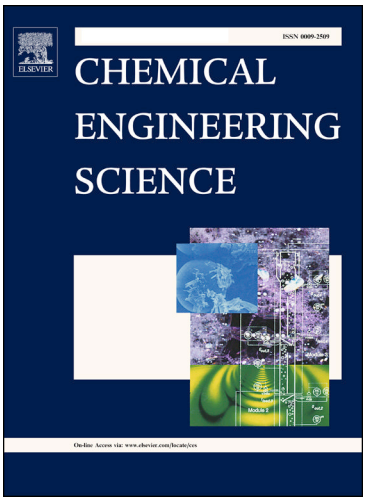

A four-parameter cubic equation of state for pure compounds and mixtures

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A four-parameter cubic equation of state for pure compounds and mixtures

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Abstract

A four parameter cubic equation of state, GDN-CEOS, is presented to describe thermodynamic properties of pure fluids and mixtures. We have cast three of the four parameters in terms of the remaining parameter and all the parameters are temperature independent. A new alpha function is proposed in the attractive term of the CEOS; which requires two compound-specific parameters determined from saturation vapor pressure data at two reduced temperature points $T_r = 0.5$ and 0.7. Hence, the GDN CEOS has five inputs per substance: the critical temperature (T_c), the critical pressure (P_c), the critical compressibility factor(Z_c) and two compound specific parameters (m, n) of the alpha function. The saturated vapor pressure and liquid density of 334 pure compounds, representing a large variety of functional groups, are predicted successfully. Other thermodynamic properties such as isobaric and isochoric heat capacities, sound velocity, compressed liquid density and enthalpy of vaporization have been calculated using GDN CEOS with remarkably good accuracy. The GDN CEOS is further applied to the prediction of bubble pressure and vapor mole fraction of several binary mixtures using the van der Waals one fluid

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