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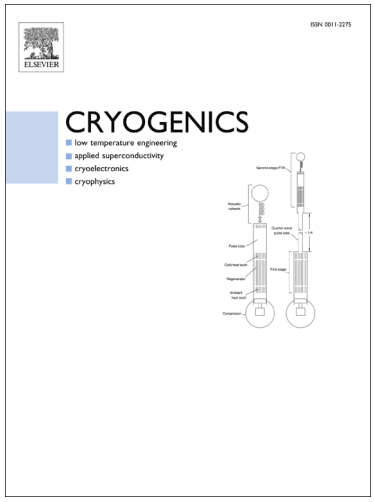

Research paper

A comparison between Peng-Robinson and Soave-Redlich-Kwong Cubic Equations of State from modification perspective

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A comparison between Peng-Robinson and Soave-Redlich-Kwong Cubic Equations of State from modification perspective

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Abstract

The Cubic Equations of State (CEOSs) are the most important tools in PVT calculations due to their simplicity in use and their extrapolative abilities to condition well outside their correlation ranges. Peng-Robinson (PR) and Soave-Redlich-Kwong (SRK) are most successful in the CEOSs which have repeatedly been modified in order to improve their accuracy in wider ranges of temperature and pressure. Unfortunately, most of modifications carried out on these EOSs have no adequate justification for selecting either of these as the basic starting point for the modifications. In this paper, PR and SRK EOSs were critically compared with each other using some new features of their subcritical and supercritical results. For this purpose, the CEOSs were assessed using comprehensive tests of the PVT calculations in the vapor-liquid equilibrium (for pure hydrocarbons over a wide range of acentric factor values: Methane, Ethane Propane, Butane, Heptane and Nonane) and Joule–Thomson Inversion Curves' (JTICs) predictions (for compounds which have reliable JTICs data: Methane, Ethane, Ethylene, Nitrogen, Oxygen, Argon and Carbon dioxide) in subcritical and supercritical regions, respectively. The results indicated that the PR EOS by using any of realistic α-function forms will never be able to accurately predict the JTICs in full span. On the other hand, the subcritical results revealed that the great success of the PR CEOS in predicting liquid phase density is only because of its function in shifting the results of the SRK CEOS to the lower values with the same curve trend. In addition, the Patel and Teja's (PT) EOS, has been reevaluated and the results showed that most of the defects of PR EOS still remain. This article suggests that in order to develop CEOSs, the original SRK EOS is a better candidate than original and alternative forms of PR EOS.

Key word: Equation of state; Modification; Soave-Redlich-Kwong; Peng and Robinson; Subcritical; Supercritical.

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