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Reliable Binary Interaction Parameters for SRK EOS for Modeling CO_2 and H_2 Storage in Depleted Oil and Gas Reservoirs

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Modeling Underground Hydrogen Storage (UHS) and Underground Carbon dioxide Storage (UCS) in depleted oil and gas reservoirs requires compositional simulation. Cubic EOS models for the reservoir fluids have the edge over other models like GERG 2008 and PC SAFT because of their application to reservoir fluids with long chain hydrocarbons and their simplicity. SRK EOS, a reliable choice of EOS, needs reliable Binary Interaction Parameters (BIPs) for its efficient and reliable applications for UHS and UCS modeling. Existing correlations for estimating BIPs for SRK EOS may not be suitable for binaries having long-chain n-alkanes. This work presents optimized BIP values and correlations for the set of components relevant to UHS and UCS storage in depleted oil and gas reservoirs. The optimization process uses large amounts of data (3241 P-x data for binary mixtures, 35 critical points data for multicomponent mixtures) and a two-step process. Optimized BIP values are presented in terms of correlations as functions of temperature (T) and carbon number (CN) of the n-alkanes.

A comparative analysis shows that the correlations proposed are more reliable for compositional phase behavior in comparison with Chueh and Prausnitz [(1)] and Oellrich et al. [(2)] BIP-correlations. The BIPs developed for CO_2, N_2, and n-alkanes mixture have fitting accuracy (AARDs) of 1.3% and 1.9% for critical temperature and critical pressure, respectively, for 35 natural gas mixtures with SRK EOS. The correlations proposed are more reliable estimates for developing an EOS model for UHS and UCS.

[1 Chueh, P.L. and Prausnitz, J.M. (1967). AIChE J.**13(6)**, 1099-1107.

[2] Oellirch et al. (1981). Int. Chem Eng. **(21).**