

Bubble Point Pressures of CO₂+Ethyl Palmitate by a Cubic Equation of State and the Wong-Sandler Mixing Rule

Authors : M. A. Sedghamiz, S. Raeissi

Abstract : This study presents three different approaches to estimate bubble point pressures for the binary system of CO₂ and ethyl palmitate fatty acid ethyl ester. The first method involves the Peng-Robinson (PR) Equation of State (EoS) with the conventional mixing rule of Van der Waals. The second approach involves the PR EOS together with the Wong Sandler (WS) mixing rule, coupled with the Uniquac Ge model. In order to model the bubble point pressures with this approach, the volume and area parameter for ethyl palmitate were estimated by the Hansen group contribution method. The last method involved the Peng-Robinson, combined with the Wong-Sandler Method, but using NRTL as the GE model. Results using the Van der Waals mixing rule clearly indicated that this method has the largest errors among all three methods, with errors in the range of 3.96-6.22 %. The Pr-Ws-Uniquac method exhibited small errors, with average absolute deviations between 0.95 to 1.97 percent. The Pr-Ws-Nrtl method led to the least errors where average absolute deviations ranged between 0.65-1.7%.

Keywords : bubble pressure, Gibbs excess energy model, mixing rule, CO₂ solubility, ethyl palmitate

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