Unit 8 - Week 6: Gaseous Mixtures and Fugacity

Assessment 6

Due on 2023-09-11, 23:59 IST.

1. Assume that species 1 and 2 in the mixture can be described by the equation of state

\[ P = \frac{nRT}{V - nB} \]

The constant \( B \) for the mixture can be approximately described by mixing rule: \( B = B_1Y_1 + B_2Y_2 \)

- \( \frac{B}{B_1} \) and \( \frac{B}{B_2} \) are constants for the mixture equal to \( 1 \) and \( 2 \) respectively.

a. What is the fugacity coefficient of component \( 1 \) of the mixture? \( \lambda_1 = ? \)

\[ \lambda_1 = \frac{P}{P^*} = 1 \]

b. What is the fugacity coefficient of component \( 2 \) of the mixture? \( \lambda_2 = ? \)

\[ \lambda_2 = \frac{P}{P^*} = 1 \]

2. Assume that pure species 1 and 2 in the mixture can be described by

\[ P = \frac{nRT}{V - nB} \]

If the constants \( B_1 \) and \( B_2 \) of pure species are \( 0.05 \) and \( 0.1 \) respectively, then what is the fugacity coefficient of each pure species? \( \lambda_{1p} = ? \) and \( \lambda_{2p} = ? \)

\[ \lambda_{1p} = \frac{P}{P^*} = 1 \]

\[ \lambda_{2p} = \frac{P}{P^*} = 1 \]

3. What is the fugacity in (mol) of a mixture of 70 mol% of ethylene \((\text{C}_2\text{H}_4)\) and 30 mol% of propylene \((\text{C}_3\text{H}_6)\) and what is the fugacity of each pure species? \( \lambda_{\text{C}_2\text{H}_4} = ? \) and \( \lambda_{\text{C}_3\text{H}_6} = ? \)

\[ \lambda_{\text{C}_2\text{H}_4} = \frac{P}{P^*} = 1 \]

\[ \lambda_{\text{C}_3\text{H}_6} = \frac{P}{P^*} = 1 \]

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