

Comparison of H₂ PSA Processes from Low Concentration of Hydrogen Feed

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The simulation study of PSA processes are studied to produce higher than 90% H₂ from 38% feed with high recovery. The feed contains CO₂, N₂, CO and CH₄ as impurities. The PSA processes are simulated by a non-isothermal dynamic model using gPROMS.

The performance of two-bed PSA is compared to that of four-bed PSA. In addition, the separation performance of the PSA using single adsorbent is also compared to that of the PSA using layered bed. Although the two-bed PSA can produce the target purity, the recovery is low due to the purge gas. However, the four-bed PSA can produce higher than 90% H₂ with very high recovery by minimizing purge gas and twice equalization steps. Furthermore, since the N₂ works as a main impurity in product, the layered bed PSA can control the product quality more efficiently than the single adsorbent bed PSA. To maximize the purity and recovery, the ratio of adsorbent in the bed plays a key role in the PSA process. Moreover, it is important to control the concentration profile of CO₂ in the bed because of its strong adsorption of adsorbent.