

ABSTRACT:

Membrane processes for H₂ purification from gas mixtures: An economic evaluation

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The potential of membrane technology in H₂ purification from multicomponent feed gas streams (e.g., containing CO₂, CH₄ etc.) is studied in this work by an economic assessment. The combination of Pd-based and zeolite membrane modules can allow the recovery of pure H₂ (which is important in several industrial applications such as ammonia production, oil refining etc.) and other high value components (e.g., CH₄), avoiding the CO₂ release in the atmosphere. Considering a simulated membrane plant treating a ternary H₂/CH₄/CO₂ mixture fed at 30 bar, a cost analysis carried out for different plant sizes (e.g., 15 and 150 kmol/h) shows that feed gas would make the main contribution, even if its price were low, followed by compression and heat exchange (Figure 1). This analysis also reveals that the membrane process can generate profit, being able to be a valid alternative to the conventional purification methods.

Figure 1. Cost percentages related to a simulated membrane plant fed with 150 (left side) and 15 kmol/h (right side) at 30 bar. Feed gas price is set to 0.20 \$/Nm³ and 0.05 \$/Nm³.

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