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Comparison between MOF UTSA-16 and BPL activated carbon in hydrogen purification by PSA

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Keywords: Metal-organic framework; activated carbon; PSA; simulation; H₂ purification.

HIGHLIGHTS

- Laboratory scale PSA hydrogen purification cycle experiments with two adsorbents: BPL AC and UTSA-16.
- Simulations of PSA cycles performed in the experiments with PSASIM[®].
- Comparison of UTSA-16 and BPL AC with simulations of a PSA cycle for hydrogen purification.

Abstract

The aim of this work is to study the application of Metal-Organic Framework (MOF) UTSA-16 in hydrogen purification PSA processes since UTSA-16 can adsorb/desorb CO, CH₄ and specially CO₂ (typical impurities of a SMR off-gas). PSA experiments (Skarstrom type PSA cycles) for hydrogen purification from a typical SMR off-gas mixture (CH₄, CO and CO₂ as impurities) were carried out using two adsorbents: MOF UTSA-16 and BPL activated carbon (BPL AC). A simulation tool developed at the University Complutense of Madrid, PSASIM[®], has been used to simulate the experimental PSA cycles. The model has been validated by reproducing the experimental results. Finally, a PSA cycle with operating conditions of hydrogen purification processes [1] has been simulated with PSASIM[®] with layered beds, containing UTSA-16/Zeolite 5A and BPL AC/Zeolite 5A. The results obtained from the

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