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C3Po1A-03: Cryogenic testing of molecular sieve materials for use in hydrogen liquefaction

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As hydrogen continues to gain momentum as a clean fuel and energy carrier in industrial sectors, hydrogen liquefaction has emerged as an essential part of the supply chain to reduce transportation and storage costs. Hydrogen has historically been produced from electrolysis and steam-methane-reforming, but as the market continues to grow, biproduct hydrogen from chemical processing and biomass reforming has become more prevalent. These processes result in the production of hydrogen feed gas with a broad range of impurities. Additionally, the development of novel liquefaction cycles which optimize performance and efficiency operate under different process conditions than traditional liquefiers. These factors have created a need for additional experimental data on molecular sieve materials. These materials are crucial for the cryogenic purification portion of a hydrogen liquefier to prevent impurities from freezing out during liquefaction, creating blockages which disrupt operations. This work presents a new experimental system that has been developed to study cryogenic purification materials over a broad range of cryogenic temperatures and impurity levels. Results of common molecular sieve materials are presented.

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