

TCAP Hydrogen Isotope Separation Using Palladium and Inverse Columns

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A TCAP (Thermal Cycling Absorption Process) experimental system was designed, fabricated and installed for hydrogen isotope separation development. This system is small and simple that permits easy operation and testing of various configurations of the process, including material screening. TCAP is a hydrogen isotope separation process which uses the isotopic absorption properties of adsorbents to separate the hydrogen isotopes in a semi-continuous method. Traditional TCAP consists of a supported-palladium packed column and a kieselguhr (diatomite) packed plug flow reverser (PFR). The kieselguhr is not an active separation medium and the PFR does not further improve the separation attained by the palladium column. Alternative packing materials such as molecular sieves as adsorbents for hydrogen isotopes were tested to replace the kieselguhr, making the PFR an active column. The active PFR becomes an inverse column that provides opposite isotopic effect of the palladium column. The replacement is proven to improve the separation attained by the palladium column significantly. Results to date demonstrated that the new configuration improved the purity of the light product and doubled the throughput. The design of the system and the experimental results will be presented.