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DEVELOPMENT OF CHARCOAL ADSORPTION CHARACTERIZATION TEST FACILITY FOR LOW TEMPERATURE HELIUM GAS PURIFICATION

Content :

The Helium refrigerator/Liquefier (HRL) is normally operated with helium gas having purity better than 99.999% by volume which is equivalent to having 10PPM (parts per million) impure gas in helium gas. We have designed, optimized and analyzed the purifiers (both for 80 K and 20 K) for the proposed Helium Liquefaction plant, but to evaluate experimentally charcoal adsorption characteristics for different gases like, N₂, O₂, Ar, H₂ and hydrocarbons, we have developed a versatile test facility. This test facility includes design and optimization of the charcoal bed and a tube in tube type 3-stream heat exchanger. This heat exchanger is designed to get different low temperatures at the charcoal bed for experimentation with different gases. It also includes appropriate cryo-piping and instrumentation layouts to accommodate different experimental requirements. The test facility also includes the supporting structure designed considering its thermal load and structural stress aspects. The main characterization aspects of charcoals are finding the effective surface area of charcoals which can be useful for adsorption and mass transfer zone corresponding to different gases and at different temperatures.

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