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Design and Development of Helium Gas Purifier

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Content :

Helium being the inert gas with lowest boiling point, offers great research potential. However, as one of the rare gases, it is considerably expensive and needs to maintain its purity for research applications. The helium purification is based on two principles, cryocondensation of moisture and air impurities on heat exchangers at appropriate temperatures and the cryosorption on activated charcoal to yield 99.995% pure helium from 5% impure helium at LN₂ temperature and at high pressure of about 42 bar.

The present work deals with the design of helium purifier system with impurity upto 5% by running a 50 hours continuous operation with the volume flow rate of 90 Nm³/hr. Moisture collector vessel, two heat exchangers, liquid air separator vessel and an adsorber column serve as the prime components of the system, while gas bag, compressor, LN₂ vessel and cylinder manifold are considered as secondary components, all are housed in superinsulated LN₂ vessel. Purification of helium involves regeneration phase and purification phase. For complete removal of moisture from charcoal beds, regeneration is done before purification, by heating and evacuation with purging of pure helium from the whole system. In purification phase, 95% of pure helium and 5% of impurity is assumed.

Primary authors : Mr. DIXIT, Avadhoot (Veermata Jijabai Technological Institute, Mumbai, India)

Co-authors : Prof. KULKARNI, Swati (Veermata Jijabai Technological Institute, Mumbai, India) ; Dr. TENDOLKAR, Mandar (Veermata Jijabai Technological Institute, Mumbai, India) ; Mr. SRINIVASAN, K V (Tata Institute of Fundamental Research, Mumbai, India)

Presenter : Mr. DIXIT, Avadhoot (Veermata Jijabai Technological Institute, Mumbai, India)

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