

Cryogenic system, gas separation and liquifaction

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Cryogenic systems Insert Insert Cryogenics is the science that entails the production of low temperatures below 123k. The application of cryogenics is in the spacecraft, medicine, mechanical industry, and the gas industry. The increased use of the inert gases necessitates the use of the cryogenic process. The process and systems are made use of in liquefaction, separation and storage activities (Atrey, 2011). The process of separating gas mixtures into individual components is referred to as gas separation it occurs in the cryogenic temperatures based on the volatilities of the component mixtures hence the term cryogenic distillation.

It is used in the production of gases like O₂, N₂, Argon, Neon, Krypton, and Xenon. Cryogenic separation has proved to be economical, increases the difference in the boiling points of constituents, process takes up large quantities and achieving purity of gases is tenable. Cryogens like LOX, LH₂ are used in rocket propulsion while LH₂ is being considered for automobile (Flynn, 2005). LN₂ is used as a coolant in cryogenic systems as well as gas refrigeration in cases where low-temperature gases are required.

Refrigeration makes use of the principle of heat change in the system, which is equal to the total internal energies (U) and the work (W); . It makes of the first and second Law of thermodynamics. Cryogenic systems are closed cycle systems comprised of the compressor, liquid containers, expander, and heat exchanger. Analysis of cryogenic process follows the Joule-Thompson expansion, which is an isenthalpic expansion process; (Barron, 1985). The systems are engineered to obey Laws of physics from the field of thermodynamics, heat transfers and refrigeration.

References

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