



Contribution ID: 684

Type: **Poster Presentation**

C1Po2B-04 [15]: Design and theoretical analysis of Helium Purification System Components for NSRRC Cryogenic System

Monday, July 22, 2019 2:00 PM (2 hours)

Helium is an expensive consumable in cryogenic facilities and is used widely in space, medical and energy research. In NSRRC, liquid helium is used as a coolant for cooling superconducting magnets and SRF cavities. Minor contaminants such as nitrogen, oxygen, moisture and oil will be picked up when liquid helium circulates in the large scale cryogenic systems, these contaminants will crystalize and might cause some damage in the cold box turbo expanders resulting in efficiency decay. Therefore, a helium purification system is designed as an integral part of the cryogenic system to conserve helium gas by providing 99.9995% pure helium to liquefier after separating contaminants from impure helium. The NSRRC helium purification process is based on two principles, the first one is cryosorption using activated charcoal and molecular sieve and the other is cryocondensation using tubular heat exchangers. The purifier has been designed for purifying impure helium with contaminants of 2.5% nitrogen and 2.5% of oxygen with mass flow rate of 475 nm³/hr and delivering pressure of 17 bar(a) of impure helium to purifier. In this paper, calculation and design of the helium purification system and components composed of one tube in tube heat exchanger, one vessel and tube heat exchanger, one pre-cooler, one charcoal vessel, mass requirement calculation of charcoal and design of other components will be discussed.

Primary authors: Mr CHUANG, Ping-Shun (National Synchrotron Radiation Research Center); Mr TSAI, Huang-Hsiu (National Synchrotron Radiation Research Center); CHIANG, Hsiao-Wei (National Tsing Hua University); Mr HSIAO, Feng-Zone (National Synchrotron Radiation Research Center); LIAO, Wun-Rong (National Synchrotron Radiation Research Center); Mr LI, Hsing-Chieh (National Synchrotron Radiation Research Center); Mr CHIOU, Wen-Song (National Synchrotron Radiation Research Center); Mr CHANG, Sheng-Hsiung (National Synchrotron Radiation Research Center); Mr LIN, Tsai-Fu (National Synchrotron Radiation Research Center)

Presenter: Mr CHUANG, Ping-Shun (National Synchrotron Radiation Research Center)

Session Classification: C1Po2B - Helium Purification