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Study of pumping speed of Activated Carbon based Cryosorption Pump

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The search for alternative means of power source to meet the need of ever increase power demand is eternal, given the present global scenario a clean and sustainable form of energy with sufficiency to meet the demand is being investigated. One such form of energy is Nuclear fusion reaction. On the onus of having a harsh condition and a requirement of high pumping speed Cryosorption pumps have emerged as an only alternative for the removal of Hydrogen and Helium in fusion reaction systems. The development of such pumping mechanism requires the appropriate Activated Carbons (ACs) and suitable adhesives to bind them to the metallic panels with liquid helium (LHe) flow channels. However, their performance evaluation will require huge quantities of LHe.

Alternatively, these cryopumps can be fabricated with small size panels adhered with ACs and cooled by a commercial cryocooler. The alternative for avoiding the use of LHe has lead us to the development of a cryopump using a commercial cryocooler, with 1.5W at 4.2 K, combined with small size AC panel mounted on 2nd stage, while the 1st stage will be acting as radiation shield. Under no load, the cryopump reaches the ultimate pressure of 2.1* 10⁻⁷ mbar. The pump is fabricated using panels with different indigenously developed ACs such as granules, pellets, ACF-FK2 and activated carbon of knitted IPR cloth. In this report, we present the experimental results of pumping speeds for various gases such as nitrogen, hydrogen, argon and helium using the procedures prescribed by the American Vacuum Society (AVS). These studies will enable us to arrive at the right ACs and adhesives required for the development of large scale cryosorption pumps with liquid helium flow.

Eligible for student paper award?

Yes

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