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Pumping speed offered by Activated Carbon at liquid Helium temperatures by sorbents adhered to indigenously developed Hydroformed Cryopanel

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Towards the aim of developing pump with large pumping speed of the order of 1 L/(s-cm2) or above for gases like hydrogen and helium through physical adsorption development of activated carbon based sorbents, like, granules, flocked fibres, knitted and non-knitted cloth sphere was carried out. To investigate the pumping speed offered, a test facility SSCF (Small Scale Cryopump Facility) which can take samples of hydro-formed cryopanel (a technology developed in India) of size ˜500 mmx 100 mm was set up as per international standards comprising a dome mounted with gauges, calibrated leak valve, gas analyzer, sorbent adhered to cryopanel etc. The cryopanel was shielded by chevron baffles. Pumping speed measurements were carried out for gases like hydrogen, helium and argon at a constant panel temperature (4.5 K to 10.0 K) in the pressure range of 1E-7 to 1E-4 mbar, and pumping speed was found to be in the range of 2000 L/s for a pressure range 1E-6 to 1E-4 mbar and 4000 L/s for pressure range 1E-7 and below for a pumping surface area of ˜1000 cm2 , thus giving an average pumping speed of about 2 L/(s-cm2). Using the Monte-carlo codes SSCF was modeled and simulation studies performed. Parameters like sticking coefficient, capture coefficients affecting the pumping speed were studied. This paper describes the experimental setup of SSCF, experimental results, simulation results from the codes and in brief about characterization of developed sorbents, based on adsorption isotherms at 4K, adsorption under dynamic equilibrium and degassing studies.

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