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C2Po1E-01 [25]: Oxygen Storage Module for Closed-Circuit Respirators using Physisorption Technology

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The new Cryogenic Flux Capacitor (CFC) technology employs nano-porous aerogel composites to store large quantities of fluid molecules in a physisorbed solid-state condition at moderate pressures and cryogenic temperatures. By its design architecture, a CFC device can be "charged"and "discharged"quickly and on-demand according to standby/usage requirements. One of three main application areas is the CFC-Life for breathing air or oxygen supply to meet new demands in life support systems. Through the LOXSM Project the National Institute of Occupational Safety and Health, and Cryogenics Test Laboratory have partnered to test the feasibility of applying the CFC technology to Closed-Circuit Escape Respirators (CCER), or respirators operating on the closed-circuit principle in general. The envisioned Cryogenic Oxygen Storage Module (COSM) is an innovative concept to store oxygen in solid-state form, according to physisorption processes at any cryogenic temperature, and deliver it as a gas using the CFC as the core storage element. Gaseous oxygen would be admitted into the breathing loop of the CCER by introducing heat into the storage module. Potentially replacing the gaseous or chemical based oxygen supply used in today's closed-circuit respirators, the COSM is a high capacity, form-fitting, small-size solution for future life support equipment of all kinds. In particular are the CCER devices that must to be carried on the person, ready to be quickly deployed and used for escape in an emergency. Initial test data for physisorption of oxygen in aerogel materials and CFC core modules are presented. The basic operational parameters for charging and discharging are summarized through prototype testing of the cryogenic oxygen storage module.

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