

Portable Cathode-Air Vapor-Feed Electrochemical Medical Oxygen Concentrator (OC)

A lightweight and robust alternative to conventional pressure-swing technology

Missions on the International Space Station and future space exploration will present significant challenges to crew health care capabilities, particularly in the efficient utilization of onboard oxygen resources. Exploration vehicles will require lightweight, compact, and portable oxygen concentrators that can provide medical-grade oxygen from the ambient cabin air. Current pressure-swing adsorption OCs are heavy and bulky, require significant start-up periods, operate in narrow temperature ranges, and require a liquid water feed. Lynntech, Inc., has developed an electrochemical OC that operates with a cathode-air vapor feed, eliminating the need for a bulky onboard water supply.

Lynntech's OC is smaller and lighter than conventional pressure-swing OCs, is capable of instant start-up, and operates over a temperature range of 5–80 °C. Accomplished through a unique nanocomposite proton exchange membrane and catalyst technology, the unit delivers 4 standard liters per minute of humidified oxygen at 60 percent concentration. The technology enables both ambient-pressure operating devices for portable applications and pressurized (up to 3,600 psi) OC devices for stationary applications.

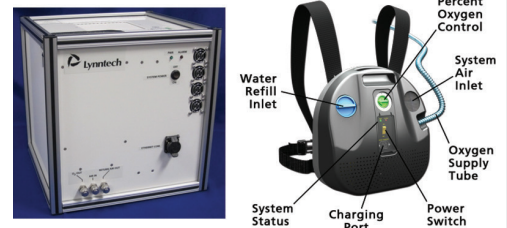
Applications

NASA

- ▶ Portable unit for pre-extravehicular activities
- ▶ Portable unit (with additional inlet filters) in the event of atmosphere contamination events, such as fire
- ▶ Source of oxygen to refill high-pressure ISS tanks

Commercial

- ▶ Oxygen source for commercial and battlefield hospitals and for medical surgeons in deployed locations
- ▶ Home therapy patients that require supplemental oxygen as a primary treatment for chronic obstructive pulmonary disease (COPD) as well as other respiratory conditions such as asthma, chronic bronchitis, congestive heart disease, emphysema, and lung cancer
- ▶ Oxygen source for wound treatment
- ▶ Long-duration oxygen supply for ambulance use



Lynntech, Inc. photos

Phase II Objectives

- ▶ Optimize moisture adsorption at the cathode
- ▶ Optimize the anode flow-field expanded metal package
- ▶ Optimize the membrane electrolyte assembly compression in the OC stack
- ▶ Design and build a prototype OC stack
- ▶ Test, characterize, and deliver a prototype OC system to NASA
- ▶ Establish long-term operational and storage requirements for delivered system
- ▶ Complete a safety analysis, final report, and flight-ready analysis document

Benefits

- ▶ Provides on-demand and/or continuous medical-grade oxygen
- ▶ Delivers 60 percent humidified oxygen gas at pressures of 5 psi and above
- ▶ Enables both ambient-pressure and pressurized (up to 3,600 psi) OC devices

Firm Contact

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