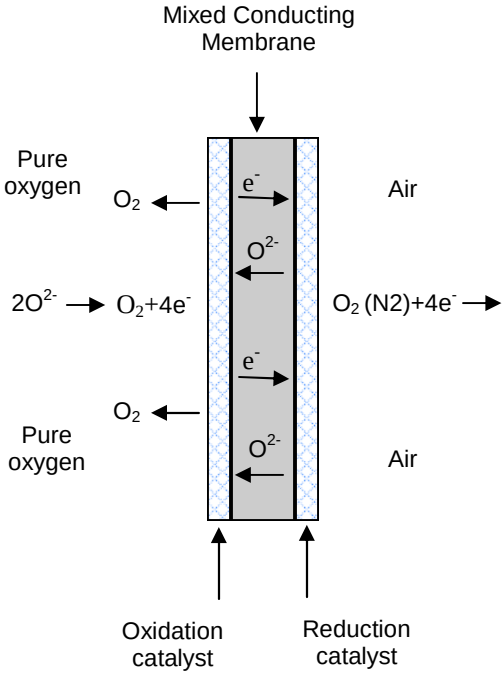
Technology Readiness Level: 6
System/subsystem Model or Prototype
Demonstration in a Relevant Environment

Eltron Research & Development

Tech Brief

Oxygen Separation Membranes

Eltron Research & Development's oxygen separation membrane technology makes use of mixed ion and electron conducting materials. Mixed ion and electron conducting ceramic membranes spontaneously separate oxygen from air at high temperature. These membranes are 100% selective to oxygen, resulting in very high purity oxygen, and are competitive with cryogenic separation methods. The high selectivity is related to the mechanism of ion transport. In a ceramic membrane oxygen separation system, oxygen molecules in air are dissociated and reduced to oxygen ions at the membrane reducing surface; the oxygen ions are then transported across the ceramic membrane and converted back to oxygen gas at the oxidizing surface. Electrons flow in the opposite direction through the membrane, forming a short circuited electrochemical device requiring no external circuitry or electrical energy input. The driving force for oxygen separation is the oxygen partial pressure difference across the membrane, and not the absolute pressure on each respective side. Because only oxygen ions are mobile within the ceramic, only oxygen from the air side will pass through the membrane to the permeate side. It excludes all other gases, such as nitrogen, carbon monoxide, argon or methane.



The separation rate scales with active membrane surface area, making this technology economically attractive for both large and small scale units. While this technology has been developed initially to compete with cryogenic units (which deliver 99+% pure oxygen) at large industrial operations, it is currently being developed to deliver oxygen to medical patients. Other examples of where such MIEC membrane technology will find application include:

- Direct oxygen separation from the atmosphere for replacing energy intensive air liquification plants used to supply a pure oxygen source for combustion or reforming processes (oxycombustion).
- Natural gas partial oxidation to synthesis gas for subsequent conversion into liquid fuels through Fisher-Tropsch process (gas-to-liquids).
- NO_X free fuel gas combustion for high temperature processing in the paper or metal industry.

Stage of Development

Eltron's research and development on mixed conducting ceramics and membrane-based reactors has led to several U.S. and foreign patents. Eltron's ceramic membrane technology was a key technology in several DOE-funded projects.

The technology has been licensed to commercial partners for use in certain fields.

Contact Us

To discuss the possibility of entering into a business relationship with Eltron, contact the Business Development Group at business@eltronresearch.com.

Eltron Research & Development

Eltron Research & Development Inc.
Eltron Research & Development Inc. commercializes novel technologies involving advanced materials, energy, water and environmental systems.

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