

HCl Reduction in a Molten LiCl-KCl-CsCl Membrane Cell

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A molten salt-based electrochemical membrane process that converts gaseous hydrogen chloride waste to chlorine has been developed. Hydrogen chloride is reduced at the cathode, while chloride ions migrate across the electrolyte-saturated membrane to the anode where they are oxidized to form gaseous chlorine.

The process employs a LiCl-KCl-CsCl (57.5%-13.3%-29.2%) electrolyte and is operated at 300°C. Previous work demonstrated the feasibility of the process, achieving HCl conversions up to 96% and producing pure chlorine. Cyclic voltammetry was later used to investigate the reduction of HCl and water in free molten salt electrolyte.

More recently experimental work has focused on cell optimization, including selection of viable cathode candidates. The electrochemical reaction mechanism and determination of anode and cathode overpotentials are currently under investigation.