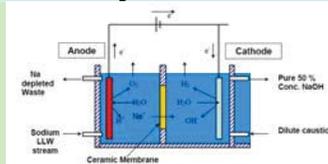


External Technical Review Summary

United States Department of Energy Office of Environmental Management (DOE-EM)

External Technical Review of Caustic Recovery Technology

Why DOE-EM Did This Review



The Department of Energy (DOE) Environmental Management

Office (EM-21) has been developing caustic recovery technology for application to the Hanford Waste Treatment Plant (WTP) to reduce the amount of Low Activity Waste (LAW) vitrified. Recycle of sodium hydroxide with an efficient caustic recovery process could reduce the amount of waste glass produced by greater than 30%. The Ceramatec Sodium (Na), Super fast Ionic CONductors (NaSICON) membrane has shown promise for directly producing 50% caustic with high sodium selectivity. *The external review objective was to assess the technical maturity of the electrochemical recovery technology and the programmatic applicability of the technology to the DOE complex, specifically to the WTP.*

What the ETR Team Recommended

The External Review Team recommends:

- (1) Additional development to better understand the stability of supersaturated aluminate solutions during caustic recovery. This understanding is needed to prevent precipitation of gel aluminate and associated plugging.
- (2) Additional production and cell life testing at 50% caustic catholyte is recommended to provide the level of confidence required for deployment. At the time of the review, a single 1000 hours test at 50% caustic had been performed. Additional testing was in progress.

The ETR also recommends that a closer collaboration between Ceramatec Inc. and WTP be established to allow for more prototypic testing including expected variations in aluminum and free hydroxide concentrations. This type of testing and data would allow for an economic analysis as to the viability of caustic recovery for WTP.

What the ETR Team Found

The technology assessment team found that this electrochemical process utilizes a novel inorganic membrane technology to recover concentrated sodium hydroxide from alkaline waste typical of decontaminated ion exchange effluents from the Hanford WTP. A successfully developed technology could be used to reduce the overall sodium demands to the LAW vitrification process at WTP by recycling the sodium hydroxide for use in aluminum leaching. The consensus was that the NaSICON electrochemical process for recovering sodium hydroxide is a viable technology at its current state of development. Additional work was identified, some of which was already in progress with the Ceramatec development program. A significant amount of work had been completed including:

- Established the tape casting/lamination manufacturing process to make large area co-fired NASICON structures.
- Using a bench-scale modular unit, completed performance evaluation with several simulant compositions and actual waste.
- NaSICON ceramic membrane processing had been scaled from 1.5 kilograms per batch up to 12 kilogram per month.
- Demonstrated greater than 2000 hours of continuous operation of NaSICON membrane-based electrolytic cells to separate sodium from a typical Hanford simulant composition
- Successfully demonstrated a 5 scaffold stacked modular bench scale cell operation at 100 mA/cm²/scaffold
- Completed initial design for a full-scale operable unit

To view the full ETR reports, please visit this web site:
<http://www.em.doe.gov/Pages/ExternalTechReviews.aspx>

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The purpose of an External Technical Review (ETR) is to reduce technical risk and uncertainty. ETRs provide pertinent information for DOE-EM to assess technical risk associated with projects and develop strategies for reducing the technical risk and to provide technical information needed to support critical project decisions. Technical risk reduction increases the probability of successful implementation of technical scope. In general, ETRs assesses technical bases, technology development, and technical risk identification and handling strategies.



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