9956 Technical Feasibility Study of Steelmaking by Molten Oxide Electrolysis

Benefits

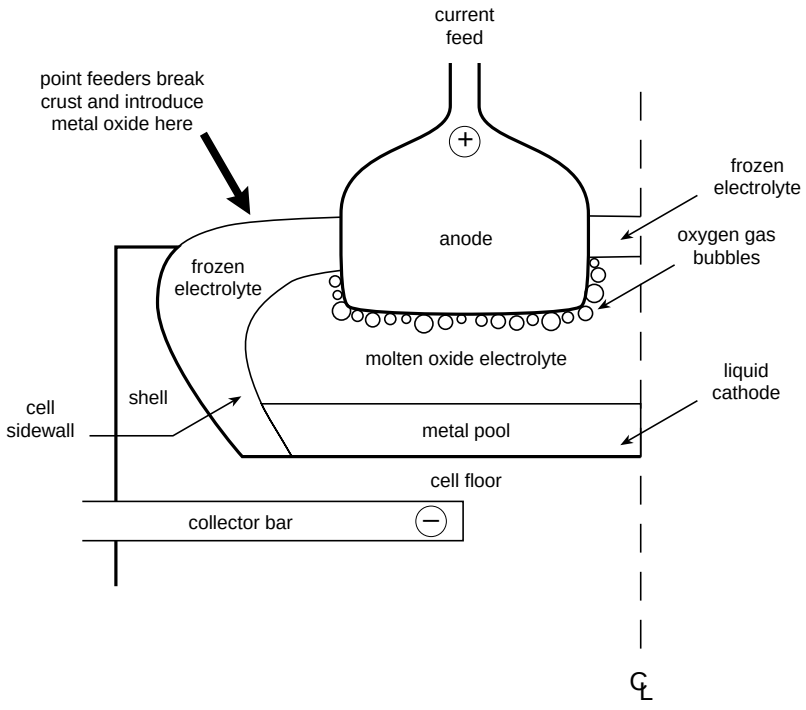
- Reduction of CO_2 emissions.
- Production of tonnage oxygen with commercial value.
- Elimination of carbon plants.
- Elimination of blast furnaces and coke ovens.

Applications

- MOE is applicable to other metallic ores.

Molten oxide electrolysis (MOE) is an extreme form of molten salt electrolysis, a technology that has been producing tonnage metal for over 100 years -- aluminum, magnesium, lithium, sodium, and the rare-earth metals are all produced in this manner. What sets molten oxide electrolysis apart from all molten salt electrolytic technologies is its use of carbon-free anodes which, in turn, facilitates the production of oxygen gas at the anode. Molten oxide electrolysis is totally carbon-free and, hence, produces no CO, no CO_2 -- only O_2. Accordingly, MOE offers powerful environmental advantages over conventional technology. Even in recognition of the use of carbon in the generation of electricity MOE ranks lowest among breakthrough technologies in terms of CO_2 emissions per unit metal product.

Cell for the Production of Iron by MOE



Project Description

Goal: Assess the technical feasibility of the process at the bench scale while determining optimum values of process operating parameters. Identify inert anode and its ability to sustain oxygen evolution will be demonstrated. The final deliverable of Phase I will be a fully functional laboratory-scale electrolysis cell that produces metallic iron along with by-product oxygen.

Progress and Milestones

- ❖ Project start date: December 2005
- ❖ Reconstruct physical plant for iron electrolysis: March 2006
- ❖ Evaluation of metal alloy anodes: July 2006
- ❖ Characterize candidate anode: October 2006
- ❖ Develop computer model for anode material selection: December 2006
- ❖ Synthesize metal alloy anodes: April 2007
- ❖ Evaluation of computer selected anodes: June 2007
- ❖ Characterize candidate anode: October 2007
- ❖ Compare and refine computer model: November 2007
- ❖ Project completion date: December 2007

Total Project Cost $532,118

Duration 2 years

Research Organization
Massachusetts Institute of Technology
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