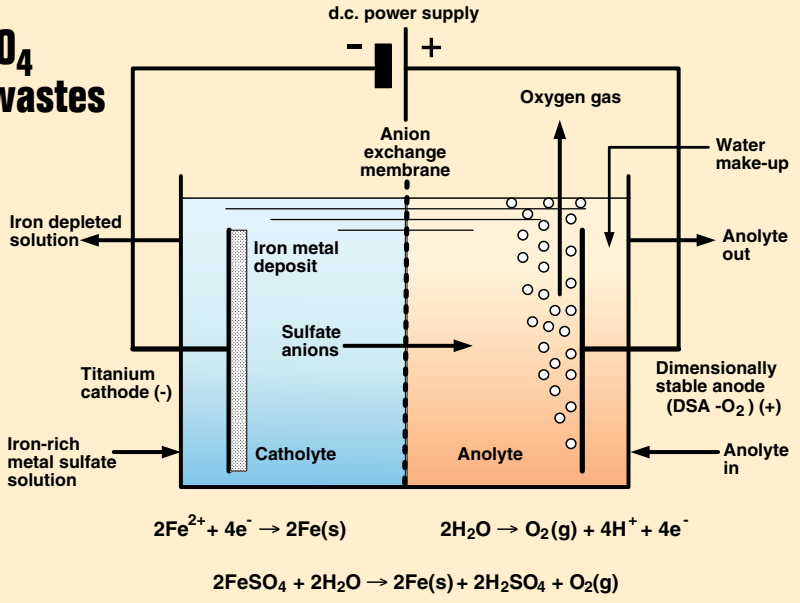
Electrochemistry regenerates H_2SO_4 and recovers iron from industrial wastes

An electrochemical process for recovering sulfuric acid and metallic iron from iron-rich sulfate wastes, such as spent pickling liquors and pregnant leach solutions generated in minerals and metals processing, has been patented by François Cardarelli, an independent researcher located in Montreal, Canada (www.francoiscardarelli.ca). Cardarelli says the process offers a green solution to the processing of these wastes, most of which currently end up in landfills or disposal piles.

In Cardarelli's process, an iron-rich sulfate solution is pH-adjusted to below 3.0 by adding a neutralizing agent, such as sodium hydroxide, and fed to the cathode side of an electrolytic cell (diagram). The adjustment is necessary to avoid the evolution of hydrogen at the cathode, a competing process, says Cardarelli. Iron deposits on the titanium cathode (a material chosen to prevent H_2 evolution), while sulfate anions migrate through an ion-exchange membrane to the anode. Initially there is a 10% solution of H_2SO_4 on the anode side. Acid removal starts when the H_2SO_4 concentration reaches about 30%. Oxygen evolves from the iridium dioxide-coated Ti anode.



Cardarelli has tested the process, using 1-ft^2 electrodes, and is negotiating with potential industrial partners to do pilot tests with units containing about 20 12-ft^2 electrodes. No cost figures are available as yet, but Cardarelli says the economics of the process depend on disposal costs, the costs of H_2SO_4 and scrap iron, and the utilization of oxygen onsite. He notes that scrap iron currently sells for about $300 per metric ton (m.t.) in the U.S. and up to $450/m.t. in Europe.

A device to measure density and viscosity non-invasively

Ultimo Measurement (Providence, R.I.; www.ultimompd.com) has developed technology for measuring density and viscosity of process fluids, loose solids and mixtures non-invasively — a percussion-based device that can be mounted on the outside of process tanks, pipes or other vessels. The device strikes a vessel's outside wall, exciting the content material, then senses the resulting vibrations, which are related to the density and viscosity of the content material by a complex combination of physical laws. Proprietary software then analyzes the oscillation data with specialized algorithms that relate the material's oscillation signature with its density or viscosity, explains Ultimo CEO Frank Lubrano. The software is adaptive and self-learning, and can discriminate between valuable and ambient vibrations.

The system's ability to collect information from outside the vessel wall lengthens its service life, since it never contacts the material being measured. Also, the adaptive nature of the striker device and analysis algorithms make the measurement tool effective with virtually all types of liquids, slurries and loose solids, and with any type or size of storage vessels or conduits constructed from a wide range of metals, fiberglass or plastic.

Lubrano points out that his company's device allows processors to obtain early data on viscosity and density, which can reduce plant waste, save resources and improve product quality. He also notes that in field-testing, the device has achieved precision of 0.1% on light powders and 0.5% on polymer materials.

The technology was originally applied as a level measurement tool, but the company has adapted its core technology for density and viscosity analyses. Ultimo has produced prototypes of the measurement devices and is looking to license its proprietary technology to partners.

Note: For more information, circle the 3-digit number on p. 62, or use the website designation.

An new olefins process

A 40,000-m.t./yr demonstration plant for a new process that produces olefins by catalytic cracking of paraffins-rich naphtha will be started up in October by SK energy (Seoul, South Korea; www.skenergy.com) at Ulsan, South Korea. Developed jointly with KBR (Houston; www.kbr.com), the Advanced Catalytic Olefin (ACO) process uses a proprietary granular zeolite catalyst in a fluidized bed.

The olefins yield is about 65% and the propylene:ethylene ratio is 1:1, versus about 50% and 0.5:1 for naphtha steam crackers, says Tim Challand, president of KBR Technology. The process temperature is about 650°C, compared to about 850°C for a steam cracker. KBR is the exclusive, worldwide licensor of the technology. (For more details on ACO, see *CE*, March 2007, p. 20).

$LiPF_6$ made in the U.S.A.

Honeywell (Morristown, N.J.; www.honeywell.com) has signed a contract with the U.S. Dept. of Energy (DOE; Washington, D.C.) for a $27.3-million grant to produce high-purity lithium hexafluorophosphate — a conductive salt that is one of four critical

(*Continues on p. 12*)