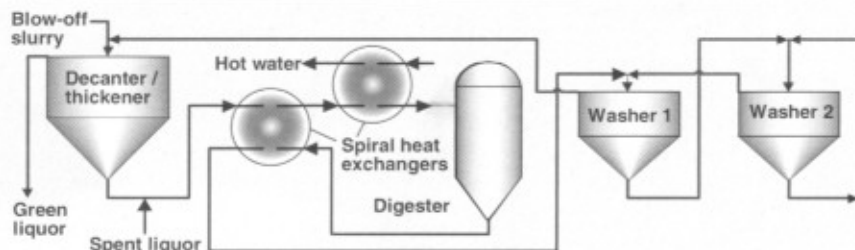


An economical way to extract more alumina from bauxite

Alumina refining by the Bayer process involves the digestion of bauxite ore with caustic soda, which produces "green liquor," from which alumina is recovered, and a bauxite residue, called red mud, which is stored in large disposal areas. A typical refinery (2-million m.t./yr) produces about 1.4 tons of bauxite-residue per ton of alumina recovered, which translates into about 2.8-million m.t./yr of red mud having to be disposed. Therefore, efforts have been underway to develop new processes to extract more alumina from bauxite residue, thereby reducing the volume generated.

A step in this direction is the M2M-Technology (mud-to-money) process, which was developed by Alcor Technology B.V. (Oegstgeest; edlinks.che.com/6898-538) and Alfa Laval Benelux B.V. (ALB; Breda, both Netherlands; edlinks.che.com/6898-539). M2M-Technology is a patented combination of well-known re-digestion and spiral heat-exchanger (SHE) technology. The second digestion step is inserted in the transfer line between decanter underflow and the first washer (flowsheet). The first



digerter is used to maximize the liquor A/C ratio (alumina-to-caustic concentration), while the second digester serves to maximize alumina extraction from the bauxite residue. Because the second digestion step reduces the evaporative requirement for handling the red mud, a SHE — designed by ALB to process thick mineral slurries — can be used for heat recovery instead of a conventional (and more expensive) flash vessel heater system, says Alcor Technology's managing director, Roelof Den Hond.

Capital costs for adding an M2M unit to a 2-million m.t./yr refinery is about \$16 million, which is returned within the first year of operation due to the 80,000-m.t./yr increase in alumina production says Den Hond. In June, Alcor Technology entered an agreement with Hencon B.V. (Ulft; Netherlands) to supply M2M-Units to the international alumina industry. The first commercial application of M2M Technology is planned for next year.

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the first commercial-scale plant for the production of granular polysilicon for the solar industry at its Berghausen, Germany, site. The 650-m.t./yr facility is expected to start up by the end of 2008, and will manufacture solar-grade polysilicon using the so-called fluidized-bed technology, which uses trichlorosilane as a feedstock. "Tests by customers who manufacture solar wafers — the starting material for solar cells — via continuous crystallization show that processing granular polysilicon is far more efficient than conventional techniques using polysilicon chunks," says Ewald Schindlbeck, president of Wacker Polysilicon. "Moreover, the comparatively low energy consumption vis-à-vis conventional deposition positively impacts the energy balance of solar cells."

Ni-Rh nanowires show promise as new catalysts

A research team from Austria and Sweden have demonstrated that nanowires of a nickel-rhodium alloy exhibit a surprisingly high reactivity to oxygen. Using physical vapor deposition, the researchers have produced quasi one-dimensional rows of Ni atoms on a single-crystal rhodium substrate, which has Rh steps precisely one atom high and terraces that are several atoms wide. The Ni is deposited at the step edges, creating a bimetallic system with precisely defined nanoscale dimensions, says Falco Netzer, the project coordinator and professor at the Inst. of Physics, Karl-Franzens University (Graz,

Austria; edlinks.che.com/6898-540).

The chemical reactivity of the Ni-Rh system was analyzed using scanning-tunneling microscopy, computer simulations and x-ray photoelectron spectroscopy using synchrotron radiation at Lund University (Sweden). "Our measurements and calculations provide clear evidence that 1D Ni rows can fully react with oxygen at a specific pressure, without a single Rh atom reacting with the O₂," says Netzer. As a result, these systems offer opportunities to develop new catalysts involving the adsorption and dissociation of O₂, he says.

Endotoxin detection

Lonza (Basel, Switzerland; edlinks.che.com/6898-553) has commercialized an online monitoring system, called PyroSense, for the automatic detection of endotoxins in water systems. The PyroSense system provides automatic, quantitative determination of endotoxin in water at selected intervals,

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Commercialization is set for a cellulose-to-ethanol process

What is billed as the first commercial-scale plant to produce ethanol from cellulosic feed will be built in Treutlen County, Georgia, by Range Fuels, Inc. (Broomfield, Colo.; edlinks.che.com/6898-541). The company received a construction permit from the State of Georgia last month and will shortly break ground for the plant. Scheduled for completion sometime in 2008, the plant will initially produce 20,000 gal/yr of ethanol and small amounts of other

alcohols from forest wood waste. Ultimately the plant will have a capacity of 100-million gal/yr.

Wood chips will be pyrolyzed with steam to produce a synthesis gas of hydrogen and carbon monoxide. A proprietary catalyst will convert the gas to ethanol, plus some methanol and small quantities of butanol and propanol. Mitch Mandich, CEO, says the advantages of the process over enzymatic routes are that it is less expensive and

can handle a wide variety of feeds. He says the first plant will have costs similar to those for corn ethanol, but expects to lower the costs in the future.

The project is one of six selected to receive grants totaling up to \$385 million from the U.S. Dept. of Energy (DOE; CE, April 2007, p. 24). All involve demonstration plants to produce ethanol from non-food biomass. Mandich says negotiations for a \$76 million grant for the Georgia plant are still under way with DOE.