Can fuel cells clean up mine waste?

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Staff

Waste water leaking from disused iron mines could be cleaned up using fuel cells, producing electricity and useful iron compounds into the bargain. Such a set-up could make cleaning up old mines more economical and efficient.

Pennsylvania has a long history of iron mining. "There's a lot of problems here with acid mine leakage," says Bruce Logan of Pennsylvania State University. Such leaks carry sulphuric acid and dissolved metals into rivers, where it kills aquatic life and can turn rivers bright red or yellow.

To tackle the problem, Logan's group adapted fuel cells originally designed to produce electricity from household sewage so that they used iron as a fuel instead. A catalyst on one side of the cell encourages dissolved iron to react with water, producing solid iron hydroxide plus hydrogen ions and electrons. The hydrogen ions diffuse through a membrane to an electrode on the other side of the cell, causing current to flow through a wire connecting the two sides (Environmental Science and Technology, DOI: 10.1021/es0712221).

The resulting power output is 300 milliwatts per square metre of catalyst, which should be enough to power the pumps and sensors that would help with the clean up if fuel cells are placed in polluted rivers. Meanwhile the ruddy, solid iron hydroxide could be used as a pigment for paint. Sulphuric acid must still be cleaned up using other methods, however, and the platinum catalyst in the cell is expensive. Logan is looking at cheaper options, such as cobalt.