

Discovery opens door to efficiently storing and reusing renewable energy

Eurekaalert!

Two University of Calgary researchers have developed a ground-breaking way to make new affordable and efficient catalysts for converting electricity into chemical energy.

Their technology opens the door to homeowners and energy companies being able to easily store and reuse solar and wind power. Such energy is clean and renewable, but it's available only when the sun is shining or the wind is blowing.

The research by Curtis Berlinguette and Simon Trudel, both in the chemistry department in the Faculty of Science, has just been published in *Science* – one of the world's top peer-reviewed journals.

"This breakthrough offers a relatively cheaper method of storing and reusing electricity produced by wind turbines and solar panels," says Curtis Berlinguette, associate professor of chemistry and Canada Research Chair in Energy Conversion.

"Our work represents a critical step for realizing a large-scale, clean energy economy," adds Berlinguette, who's also director of the university's Centre for Advanced Solar Materials.

Simon Trudel, assistant professor of chemistry, says their work "opens up a whole new field of how to make catalytic materials. We now have a large new arena for discovery."

The pair have patented their technology and created from their university research a spin-off company, FireWater Fuel Corp., to commercialize their electrocatalysts for use in electrolyzers.

Electrolyzer devices use catalysts to drive a chemical reaction that converts electricity into chemical energy by splitting water into hydrogen and oxygen fuels. These fuels can then be stored and re-converted to electricity for use whenever wanted.

The only byproduct from such a 'green' energy system is water, which can be recycled through the system.

To store and provide renewable power to a typical house would require an electrolyzer about the size of a beer fridge, containing a few litres of water and converting hydrogen to electricity with virtually no emissions, the researchers say.

Key to their discovery is that they deviated from conventional thinking about

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catalysts, which typically are made from rare, expensive and toxic metals in a crystalline structure.

Instead, Berlinguette and Trudel turned to simpler production methods for catalysts. This involved using abundant metal compounds or oxides (including iron oxide or 'rust'), to create mixed metal oxide catalysts having a disordered, or amorphous, structure.

Laboratory tests – reported in their Science paper – show their new catalysts perform as well or better than expensive catalysts now on the market, yet theirs cost 1,000 times less.

Their research was supported by the university's Institute for Sustainable Energy, Environment and Economy, Alberta Innovates, Mitacs and FireWater Fuel Corp.

FireWater Fuel Corp. expects to have a commercial product in the current large-scale electrolyzer market in 2014, and a prototype electrolyzer – using their new catalysts – ready by 2015 for testing in a home.

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