

Better chemistry through living models

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Scientists at Pacific Northwest National Laboratory will receive \$1.98 million from the U.S. Department of Energy over the next three years to emulate nature's use of enzymes to convert chemicals to energy, PNNL announced Wednesday (June 6).

The information that scientists at the DOE national lab turn up may point to new materials that render it economically feasible to produce energy from hydrogen fuel cells.

“This is a basic research project, but one that we hope will provide new knowledge that will be pertinent to the production of hydrogen or oxidation of hydrogen in fuel cells,” said Morris Bullock, co-leading the project with Dan DuBois. Both Bullock and DuBois are members of the Molecular Interactions and Transformations group and the Institute for Interfacial Catalysis at PNNL.

Bullock noted that an electrocatalytic reaction, or energy made by catalytic oxidation of hydrogen in fuel cells, “is very attractive for many applications.” But so far, such chemical conversions are expensive; fuel cells require the precious metal platinum. “We seek to prepare new metal complexes based on abundant, inexpensive metals such as iron, manganese and molybdenum.”

To search for electrocatalyst alternatives to platinum, the team will be guided by natural systems like those in species of bacteria and algae that enlist hydrogenase enzymes in energy production. Bullock and colleagues hope “to replicate the function but not the exact structure” of

the natural enzymes.

Recent structural studies of hydrogenase enzymes from these microorganisms have revealed that sites where electrocatalysis takes place contain nuclei made up of iron-iron or nickel-iron complexes.

These enzymes' high catalytic activity suggests that properly designed synthetic catalysts based on inexpensive metals can be used in fuel cells for this important energy-conversion reaction in place of platinum.

The PNNL award is among 13 basic-research projects funded by \$11.2 over the next three years by the Basic Energy Sciences program of the DOE Office of Science. The research aims to overcome challenges associated with the production, storage and use of hydrogen.

Source: Pacific Northwest National Laboratory

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