Scientists develop cheaper, more efficient fuel cells

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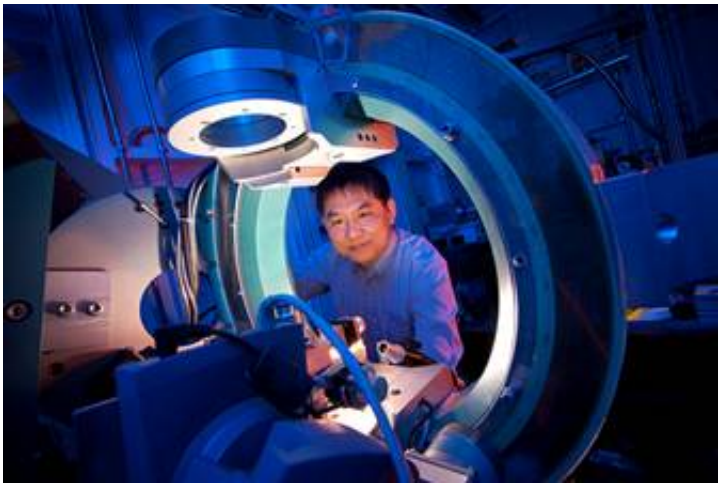

(Phys.org) —Using the Canadian Light Source (CLS) synchrotron, researchers have discovered a way to create cheaper fuel cells by dividing normally expensive platinum metal into nanoparticles (or even single atoms) for use in everything from automobiles to computers.

The research findings, led by Western University's Xueliang (Andy) Sun and Tsun-Kong (T.K.) Sham, were published recently by *Scientific Reports*, Nature's online, open access, multidisciplinary publication: "Single-atom Catalysis Using Pt/Graphene Achieved through Atomic Layer Deposition."

After collaborating with researchers from McMaster University, the CLS synchrotron, and Ballard Power Systems Inc., Sun and Sham developed a method of utilizing atomic layer deposition (ALD). This surface science technique is used for depositing chemical compounds, to create single atom catalysts. This is a major boon for the three-headed battle against global energy demands, depletion of fossil fuel reserves, and environmental pollution problems.

"Platinum, which is very expensive, is often used as a catalyst but only the surface atoms are doing the work," says Sun, Canada Research Chair in Nanomaterials for Energy Conversion and Storage. "The rest of the atoms, below the surface, have no function as a catalyst so you are basically paying for 100 per cent of the platinum but only using 10 to 20 per cent."

"By dispersing the platinum, each and every one of the atoms increases efficiency," says Sham, Canada Research Chair in Materials and Synchrotron Radiation. "Dispersing platinum also provides much more bang for our buck, which makes government, industry and consumers very happy."

Sham says synchrotron radiation and an ultra-high resolution transmission electron microscope play a big role in tracking the chemical properties of platinum and its performance, explaining that the technique basically divides platinum into as "small as possible" parts, so the surface area can be maximized.

Scientists were able to find these results using the Hard X-ray MicroAnalysis (HXMA) beamline at the CLS – one of the best facilities in the world for fuel cell research, says CLS Director of Industrial Science, Jeff Cutler.

"Making advancements in fuel cell technology is an extremely important

mandate for scientists," says Cutler. "The CLS synchrotron is one of the best facilities in the world to conduct this type of nanomaterial research and Ballard Power Systems is one of the top fuel cell technology companies. By working with this industry partner we hope to provide them with insight that will be important for the production of the next generation of fuel cells."

Siyu Ye, Principal Research Scientist with Ballard Power Systems, thinks the collaboration was the key to getting successful results.

"Ballard Power Systems Inc. is a global leader in fuel cell technology and by working with researchers at the Canadian Light Source, Western University and McMaster University, we were able to make a great progress towards producing cheaper and more efficient fuel cell catalysts," says Ye. "Platinum is a precious material but a great catalyst. By using less of this material in a more efficient way, fuel cells can be made more cost effective, and thus support wide-spread commercialization."

More information: www.nature.com/srep/2013/13050 … /full/srep01775.html

Provided by Canadian Light Source