Metal particle generates new hope for H2 energy

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Hydrogen from water using solar radiation: new hope for cheap, clean energy

(PhysOrg.com) -- Tiny metallic particles produced by University of Adelaide chemistry researchers are bringing new hope for the production of cheap, efficient and clean hydrogen energy.

Led by Associate Professor Greg Metha, Head of Chemistry, the researchers are exploring how the metal nanoparticles act as highly efficient catalysts in using solar radiation to split water into hydrogen and oxygen.

“Efficient and direct production of hydrogen from solar radiation provides a renewable energy source that is the pinnacle of clean energy,” said Associate Professor Greg Metha. “We believe this work will contribute significantly to the global effort to convert solar energy into

portable chemical energy."

The latest research is the outcome of 14 years of fundamental research by Associate Professor Metha's research group investigating the synthesis and properties of metal nanoparticles and how they work as catalysts at the molecular level.

The group works with metal "clusters" of about one-quarter of a nanometre in size – less than 10 atoms. Associate Professor Metha said these tiny "magic clusters" act as super-efficient catalysts. Catalysts drive chemical reactions, reducing the amount of energy required.

"We've discovered ways of producing these tiny metallic clusters, we've explored their fundamental chemical activity, and now we are applying their catalytic properties to reactions which have great potential benefit for industrial use and the environment," said Associate Professor Metha.

PhD student Jason Alvino is exploring splitting water to make hydrogen (and oxygen) using solar energy – a process that is not viable for industry development at the moment.

"We know this catalysis works very efficiently at the molecular level and now need to demonstrate it works on the macroscopic scale," said Associate Professor Metha.

"Splitting water to make hydrogen and oxygen requires a lot of energy and is an expensive process. We will be using solar radiation as the energy source, so there will be no carbon emissions and because the clusters work so efficiently as a catalyst, it will be a much better process.

"The ultimate aim is to produce hydrogen from water as a cheap portable energy source."

Associate Professor Metha said there were also other industrial chemical reactions that could be made feasible by these catalysts, using solar radiation as the energy source - with potentially significant environmental benefits. One example was converting carbon dioxide into methane or methanol with water.

This project 'Solar Hydrogen: photocatalytic generation of hydrogen from water', has been funded under the three-year clean energy partnership between Adelaide Airport Ltd and the University's Centre for Energy Technology.

Provided by University of Adelaide