Researchers pioneer molecular catalyser

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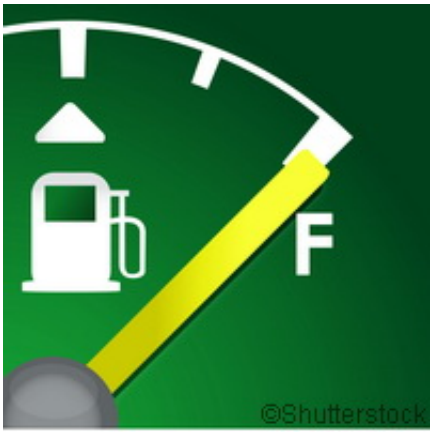

Scientists in Sweden have developed a molecular catalyser with the ability to quickly oxidise water to oxygen. Presented in the journal Nature Chemistry, the results are a significant contribution to the future use of solar energy and other renewable energy sources, especially since gasoline prices continue to soar.

The team from the Royal Institute of Technology (KTH) in Stockholm is the first to attain speeds that are comparable to those in nature's own photosynthesis, thus succeeding in clinching a world record. Researchers in Europe, Japan and the United States have been investigating ways of refining an artificial form of photosynthesis for over 30 years. No team ever succeeded in generating a sufficiently rapid solar-driven catalyser for oxidising water.

'Speed has been the main problem, the bottleneck, when it comes to creating perfect artificial photosynthesis,' explains Professor Licheng Sun from the Department of Chemistry at KTH.

The molecular catalyser developed by Professor Sun and his team is so fast that it can reach more than 300 turnovers per seconds. The speed with which natural photosynthesis is carried out is between 100 and 400 turnovers per seconds.

'This is clearly a world record, and a breakthrough regarding a molecular catalyser in artificial photosynthesis,' remarks Professor Sun. 'This speed makes it possible in the future to create large-scale facilities for producing hydrogen in the Sahara, where there's an abundance of sunshine. Or to attain much more efficient solar energy conversion to electricity, combining this with traditional solar cells, than is possible today.'

This is especially important as society continues to deal with rising gasoline prices. According to the scientists, the fast molecular catalysers can form the basis for many changes to come. Not only do they enable sunlight to be used for the conversion of carbon dioxide (CO_2) into different fuels like methanol, but the technology can be used to convert solar energy directly into hydrogen.

The next step for the researchers is to develop this technology at lesser cost.

'I'm convinced that it will be possible in 10 years to produce technology based on this type of research that is sufficiently cheap to compete with carbon-based fuels,' the chemist says. 'This explains why [US President] Barack Obama is investing billions of dollars in this type of research.'

Professor Sun has been conducting research in this field for almost 20

years, saying that he and his colleagues believe efficient catalysers for oxidation of water can be the missing piece of the solar energy puzzle.

'When it comes to renewable energy sources, using the Sun is one of the best ways to go,' Professor Sun says.

Researchers from Uppsala University in Sweden and the Dalian University of Technology (DUT) in China contributed to this study.

More information: Duan, L. et al. 'A molecular ruthenium catalyst with water-oxidation activity comparable to that of photosystem II', *Nature Chemistry*, 2012. doi:10.1038/nchem.1301

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