Materials advance promises to help power clean energy economy

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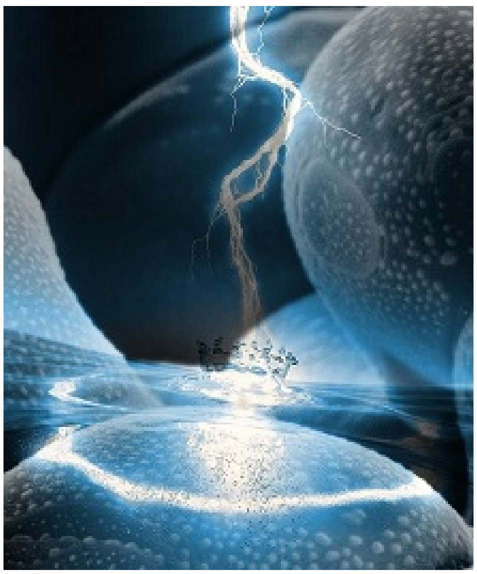

Credit: University of St Andrews

St Andrews researchers have made an important step forward in the quest to store electricity from intermittent energy sources such as wind and solar.

Energy conversion technology holds the key to storing energy on large scales – making wind and solar more economical and reliable – and solid oxide cells (SOCs), which operate with high efficiency over a wide range of scales, offer the best prospects.

However, until now scientists have struggled with the technical challenge of developing the electrodes required to deliver high, long-lasting electrocatalytic activity while ensuring cost- and time-efficient manufacture.

Now Professor John Irvine and his team have developed a new method of electrochemical switching, which simplifies the manufacture of the electrodes required to deliver high, long-lasting energy activity.

The results, published in *Nature* today (Monday 22 August 2016), demonstrate a new way to produce highly active and stable nanostructures – by growing electrode nanoarchitectures under operational conditions. This opens exciting new possibilities for activating or reinvigorating fuel cells during operation.

Professor Irvine explains: "Fuel cell and electrolysis technologies offer great opportunities to deliver clean energy and impact on global warming in the immediate future. The technologies are already available; however advances in performance and durability are needed to allow rapid implementation. This study affords great enhancements in performance and provides means to reinvigorate during operation, greatly extending useful lifetime through intricate manipulation of nanostructural features."

These new electrode structures are capable of delivering high performances in both fuel cell and electrolysis mode and both the nanostructures and corresponding electrochemical activity show no degradation over 150 hours of testing.

This invention is not only relevant for high-temperature energy conversion devices such as SOCs, but also for catalysis for reforming hydrocarbon gas, photo-catalysis for hydrogen production, and other potential devices for energy production, storage, or consumption.

It's expected this breakthrough may have implications well beyond high temperature electrochemical devices – and might support advances in handheld electronic devices, cars, and even buildings.

More information: Jae-ha Myung et al. Switching on electrocatalytic activity in solid oxide cells, *Nature* (2016). DOI: 10.1038/nature19090

Provided by University of St Andrews

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