ECOS
SCIENCE FOR SUSTAINABILITY
www.ecosmagazine.com

Published: 13 August 2012

Salt-and-water battery could help plug renewables gap

Australian researchers have developed a sodium-ion-based battery which, they say, has the potential to solve one of sustainable energy's greatest challenges – storing energy cheaply 'offline' after it has been generated.

Credit: Frank Kehren/flickr under **Creative Commons CC BY-NC-ND 2.0 licence**

Dr Manickam Minakshi and Dr Danielle Meyrick from Western Australia's Murdoch University point out that, while the efficiency of wind and solar technologies has improved rapidly, the problem of storage has yet to be solved.

'The central obstacle facing sustainable energy is unreliability. Wind turbines don't turn on a still day. Solar doesn't work at night and can be hampered in the day by cloud, dust or snow coverage,' Dr Minakshi said.

'To provide power at non-generation times, excess energy needs to be stored in batteries, but storage technologies now being considered, such as molten salt or molten sulfur, work at high temperatures, making them expensive and impractical.

'Our water-based sodium-ion battery has shown excellent potential for affordable, low-temperature storage.'

Dr Minakshi said he was drawn to sodium because its chemical properties were similar to lithium, the element that powers most portable electronic devices. While lithium ion batteries are common in today's consumer electronics, they require inbuilt safety mechanisms that can affect efficiency; as well, lithium batteries tend to fail after a few years.

The Murdoch University researchers say the main challenge they faced in developing a sodium-ion battery was finding cathode and anode materials capable of accommodating sodium's ionic size – which is 2.5 times larger than that of lithium.

'Ions travel out of the cathode and into the anode to form a current. As an imperfect analogy, you can think of [electrodes] as mesh filters that ions pass through. We had to find materials with larger gaps in their mesh,' Dr Minakshi said.

After testing various metals and phosphates, Dr Minakshi's team eventually found success with manganese dioxide as the cathode and a novel olivine sodium phosphate as the anode. The result is a safe, cost-effective battery with high energy density.

‘While the technology is too bulky for portable devices, it has excellent potential for large-scale use, including storing energy from wind turbines and solar farms for later feeding into local electricity grids, as well as use in industry,’ Dr Minakshi said.

‘Our research has reached the stage where we’re ready to move beyond our lab towards larger-scale commercialisation. This is a very exciting time.’

The battery has the added advantage of being based on globally abundant and affordable sodium, iron and manganese – putting green energy potential in the hands of the developing world.

Source: Murdoch University

From **ECOS** online **http://www.ecosmagazine.com/?paper=EC12385**