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Better Batteries

UNH research could lead to safer, lower-cost battery technology

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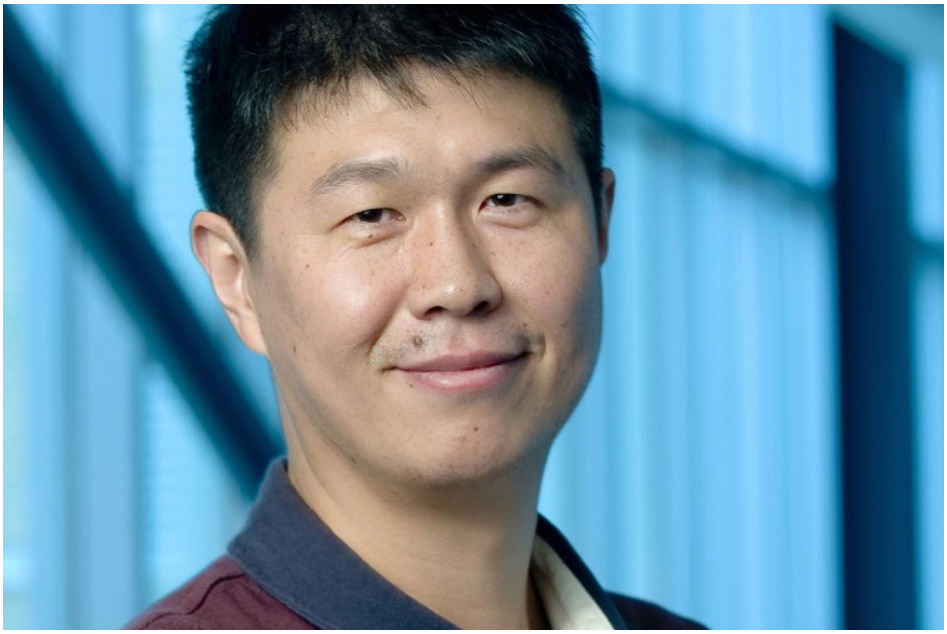

XIAOWEI TENG, ASSOCIATE PROFESSOR OF CHEMICAL ENGINEERING

UNH researchers have developed an alternative energy storage system that could lead to a less dangerous and more cost-effective battery technology than some

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THE RESEARCHERS SET OUT TO FIND A SOLUTION THAT COULD LEAD TO A RECHARGEABLE ENERGY STORAGE DEVICE WITH BETTER SAFETY AND A LOWER COST. PHOTO COURTESY OF TENG LAB.

currently on the market. The more environmentally friendly device could offer a less harmful alternative to the more potentially combustible batteries that have been making headlines for catching on fire in cell phones, hover boards and automobiles.

The team of researchers at UNH set out to look for a solution that could lead to a rechargeable energy storage device that would offer more enhanced safety yet be reliable and low cost. In their study, recently published in Nature Communications (Bivalence Mn5O8 with hydroxylated interphase for high-voltage aqueous sodium-ion storage), they outline their approach of modifying a unique form of manganese oxide known as Mn5O8.

“This manganese oxide mineral was first studied back in 1965 but since then very few people have considered it in designing today’s rechargeable energy storage,” says Xiaowei Teng, associate professor of chemical engineering. “The challenge with creating electrode materials for aqueous, or water based, energy storage like this one is being able to get enough charge, or discharge, cycles and a good amount of storage capability. So we thought altering the way the Mn5O8 was prepared for use in battery

electrodes might make it a viable option."

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Aqueous electrochemical energy storage (EES) devices have attracted significant attention lately because their electrolyte is water-based and, therefore, less likely to combust once exposed to air or moisture. Besides having more potential to cause a fire, lithium batteries are made from an expensive element that is in scarce supply and according to some experts, might be in danger of depletion at the current consumption rate. Cost-effective energy storage has long been described as the key for the widespread adoption of renewable energy practices. Rechargeable aqueous batteries, especially ones using earth-abundant and non-toxic materials, have shown great promise for many applications owing to their high safety, low cost and environmental friendliness. However, they traditionally have had narrow applications because of their limited capacity and are not always easy to charge to a high voltage.

Teng and his team, Xiaoqiang Shan and Daniel Scott Charles, both PhD candidates in the chemical engineering department at UNH, altered the way that the manganese oxide materials were used as an electrode in the energy storage device. They modified the Mn_5O_8 electrode material with a well-ordered hydroxylated interphase. Doing this allowed for the potential of creating a more reliable aqueous battery with more energy storage (3.0 V, which is comparable to most standard non-aqueous devices), as well as increased power performance and charge cycles (85% energy

efficiency after 25,000 charge–discharge cycles; much longer than existing non-aqueous devices). Also, as an aqueous phase energy storage device, preparation of electrodes under air- and moisture-free environment is unnecessary, resulting in lower cost of production and cell packaging when compared to non-aqueous, or lithium, devices.

UNH has a patent on Teng's research and is actively seeking commercialization opportunities. For information on licensing these innovations, contact Matt Simon at UNHInnovation.

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WRITTEN BY: Robbin Ray ’82 | Communications and Public Affairs | robbin.ray@unh.edu | 603-862-4864

PHOTOGRAPHER: Lisa Rugent | Web & Mobile Development

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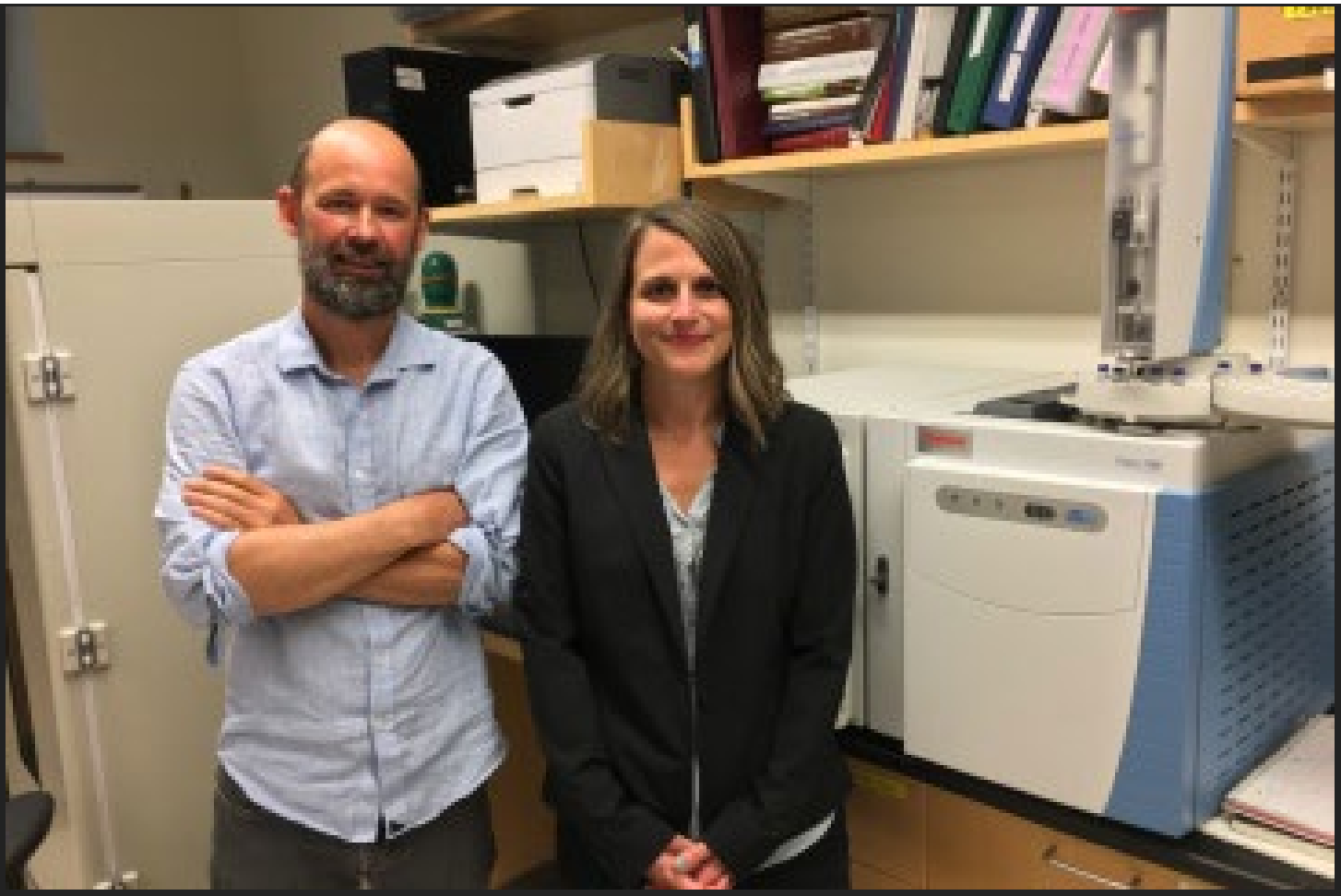

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