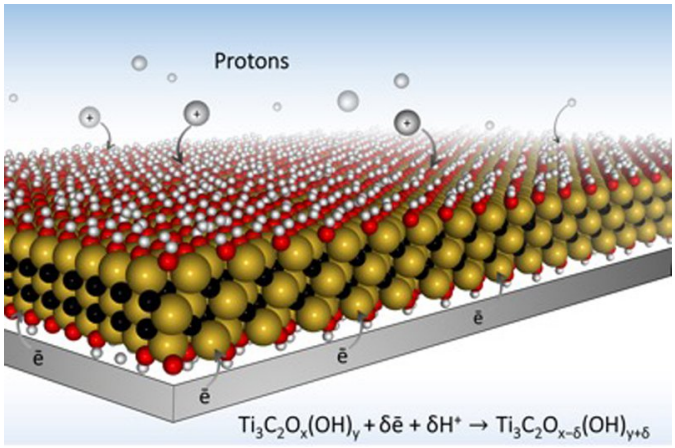
Researchers at the Drexel College of Engineering present a new kind of battery electrode made with MXene, a highly conductive nanomaterial promising faster charging chemical batteries.



The MXene material is nearly two dimensional material similar to a sandwich. It combines oxide "bread" with a conductive carbon and metal "filling," with layers stacked on top of each other like a Pringles. However the structure, while highly conductive, makes it difficult for ions, the chemical carriers of charge, to diffuse to through the battery. To resolve the issue, the researchers combined the MXene with a hydrogel, turning the Pringles into a swiss cheese through which ions can flow freely.

"In traditional batteries and supercapacitors, ions have a tortuous path toward charge storage ports, which not only slows down everything, but it also creates a situation where very few ions actually reach their destination at fast charging rates," the team says. "The ideal electrode architecture would be something like ions moving to the ports via multi-lane, high-speed 'highways,' instead of taking single-lane roads. Our macroporous electrode design achieves this goal, which allows for rapid charging-- on the order of a few seconds or less."

The result, the researchers say, is batteries with the super-fast charging capability of supercapacity, all while storing much more energy. This should make the technology ideal for any kind of battery-powered device, from smartphones to electric vehicles, even if it is unclear as to whether how far it can be scaled. But that is where more research comes into play.

Go Entering the Fast Lane-- MXene Electrodes Push Charging Rate Limites in Energy Storage