Hybrid Battery: Super-Capacitor Electrode Combined of Mo6S8 (Chevrel Phase) and Ti3C2 (MXene)

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Purpose: Modern mobile devices require quicker charging times and larger power supplies. We combined the qualities of batteries and capacitators to create a hybrid device that is flexible, organic, charges quickly and delivers a lot of power over a longer time. Procedure: We integrated MXene (Ti3C2) – a supercapacitor electrode and Chevrel (Mo6S8) through vacuum filtration and created a battery compound operating in a super-concentrated aqueous-based (14M) LiCl electrolyte solution. We used an optimal MXene/Chevrel ratio as a negative electrode in a full battery prototype. Results We successfully combined MXene with a typical battery compound into a hybrid aqueous device for the first time by using saturated LiCl as an electrolyte, demonstrating the widest potential window ever achieved for MXene in aqueous solutions. The extended voltage range of the Ti3C2 and the positive Nernstian shift of the Mo6S8 into the MXene operation window created a binder-free MXene/Chevrel electrode which exhibits both high energy and power densities. We built a functioning 2.05V device composed of the hydride MXene/Chevrel as the negative electrode and activated carbon as the positive electrode. Conclusions/Applications: Our system proposes to bridge the gap between batteries and supercapacitors and can be applied in load leveling systems, improved regenerative braking systems in electric vehicles, shorter charging times and longer traveling distances for electric buses and for portable electronic devices that require very fast charge/discharge cycles