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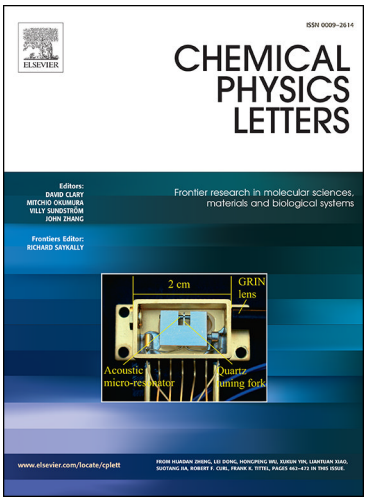

Research paper

A pH dependent high voltage aqueous supercapacitor with dual electrolytes

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A pH dependent high voltage aqueous supercapacitor with dual electrolytes

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KEYWORDS: Supercapacitors, Acid Alkali Chemistry, Voltage Window, Water Splitting Reaction, Energy Density

ABSTRACT: Improving the energy density without compromising the power capability is a classical challenge for electrochemical capacitors. Since energy is quadratically related to voltage by 1/2(Capacitance)(Voltage)^2 the most beneficial strategy to boost the energy density is to target the working voltage window. However, expanding the voltage window beyond 1.23 V in aqueous system is thermodynamically challenged due to parasitic water splitting reactions. We show that the parasitic chemistry can be arrested by decoupling the direct acid-alkali chemistry, and the voltage window in aqueous supercapacitors can be expanded with energy boosting up to ~230 %.

1. Introduction

Electrochemical energy storage and conversion devices are potential candidates to restrict global warming within 1.5°C as proposed by UN conference on climate change.[1-15] Batteries