

High frequency response of flexible electrochemical capacitor for AC line-filtering

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Slow charging-discharging rate of flexible electrochemical capacitors (FECs) is a critical challenge of current self-powered portable electronics. Mostly, FECs function as a power source at direct current, but quit functioning of pulse energy harvesting and current ripple filtering, like conventional capacitors. Thus, portable electronics calls for high frequency response FECs. Motivated from this requirement, we demonstrate ultrafast frequency response of FECs integrating conducting polymer/MXene hybrid electrodes and polymer gel electrolyte. The composite ratio and thickness of material matrix dramatically influences the frequency response behavior of FECs. The FECs with optimized electrode material features accomplished excellent volumetric capacitive and frequency response with bending functionality. Additionally, the real-life capability of fabricated FECs for AC line filtering was demonstrated through LED as DC indicator with bent ECs. Therefore, the high volumetric capacitance and robust frequency response of fabricated FECs offers the most requisites of self-powered portable electronics.