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Polymer nanofiber array for high-performance supercapacitors¹ SHIREN WANG, Texas A&M Univ, JENNY QIU, Texas Tech University — The vertically aligned polyaniline (PANI) nanowires arrays and monolayer graphene sheets were layer-by-layered deposited to specific substrate for tailored structures. Driven by external voltage, aniline molecules and graphene oxide were alternatively assembled for hierarchical porous three-dimensional nanostructures while graphene oxide was in-situ reduced to graphene during the assembly process. As-produced stacked arrays were used as the electrodes of an ultra-capacitor, and an unusual electrochemical behavior was discovered. The capacitance increases as the stack of nanowire arrays increases, resulting in high energy density and high power density at same time. Further analysis found that the distinctive electrochemical behavior originates from the electrode/electrolyte interactions and the dependence on the diffusion and charge transferring process. The specific energy density was as high as 137 Wh/Kg while power density is in excess of 2000 W/Kg. This work pointed a simple pathway to tailor polymer structure and electrochemistry for robust design of high-performance ultra-capacitor at a limited lateral size.

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