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A novel strategy for the high performance supercapacitor based on polyacrylonitrile-derived porous nanofibers as electrode and separator in ionic liquid electrolyte

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Abstract: A novel strategy for the supercapacitor with high energy and power performance using porous nanofibers as the electrodes and separators in ionic liquid electrolyte is proposed. Polyacrylonitrile (PAN) porous nanofibers separator is prepared *via* electrospinning and solvent phase separation process, which exhibit high electrolyte uptake and ionic mobility. The porous carbon nanofibers electrode derived from PAN porous nanofibers shows high conductivity, specific surface and ionic mobility. The porous nanofibers are characterized by scanning electron microscopy, thermal gravimetric and contact angle analysis *etc*. The electrochemical performances of porous nanofibers are investigated by electrochemical measurements. The influence of pore structure on the electrochemical performance of porous nanofibers is evaluated. The supercapacitor constructed by porous nanofibers as electrode and separator in ionic liquid electrolyte exhibits high specific capacity (248.3 F g^{-1}), low internal resistance (0.82 Ω), wide electrochemical stability window (3.5 V) and good cyclstabilty (99.8 %). The results show that electrospinning is an efficient technique for producing separator and electrode materials of supercapacitor without compromising the eco-friendliness and raw material cost.

Keywords: porous nanofiber, electrospinning, supercapacitor, separator, ionic liquid

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