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Flexible poly(vinyl alcohol)-ceramic composite separators for supercapacitor applications

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Electrochemical characterization was conducted on poly(vinyl alcohol) (PVA)-ceramic composite (PCC) separators for supercapacitor applications. The PCC separators were fabricated by mixing various ceramic particles including aluminum oxide (Al_2O_3), silicon dioxide (SiO_2), and titanium dioxide (TiO_2) into a PVA aqueous solution. These ceramic particles help to create amorphous regions in the crystalline structure of the polymer matrix to increase the ionic conductivity of PVA. Supercapacitors were assembled using PCC separators with symmetric activated carbon electrodes and electrochemical characterization showed enhanced specific capacitance, rate capability, cycle life, and ionic conductivity. Supercapacitors using the PVA-TiO_2 composite separator showed particularly good electrochemical performance with a 14.4% specific capacitance increase over supercapacitors using the bare PVA separator after 1000 cycles. With regards to safety, PVA becomes plasticized when immersed in 6 M KOH aqueous solution, thus there was no appreciable loss in tear resistance when the ceramic particles were added to PVA. Thus, the enhanced electrochemical properties can be attained without reduction in safety making the addition of ceramic nanoparticles to PVA separators a cost-effective strategy for increasing the ionic conductivity of separator materials for supercapacitor applications.

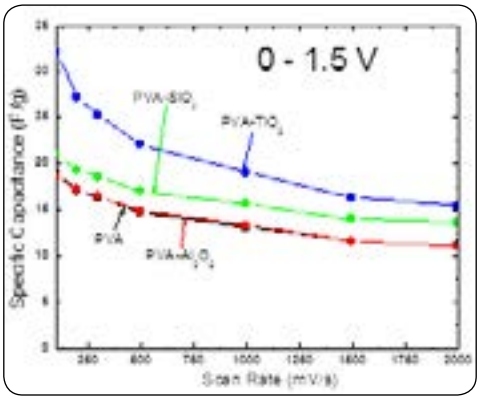

Figure 1: The plot of specific capacitance versus scan rate for various PVA-ceramic composite separators

Biography

Sang Hern Kim has his expertise in polymer synthesis. He synthesized novel polymers and tried to apply them to electro-material and other fields.

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