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## Development of nanocomposite polymer electrolytes (NCPEs) in electric double layer capacitors (EDLCs) application

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Nanocomposite polymer electrolytes (NCPEs) containing silica ( $\text{SiO}_2$ ), zirconia ( $\text{ZrO}_2$ ), titania ( $\text{TiO}_2$ ) and alumina ( $\text{Al}_2\text{O}_3$ ) are prepared using solution casting technique and characterized using various analyses. The effect of adding nano-sized fillers in the polymer electrolyte is investigated throughout the work. Doping of nanoscale fillers increases the ionic conductivity of polymer electrolytes and widens the electrochemical potential window. All the polymer electrolytes obey Arrhenius theory and prove the presence of ionic hopping mechanism in the polymer matrices as shown in the temperature dependent study. Addition of fillers also reduces the glass transition temperature ( $T_g$ ) and the degree of crystallinity of the polymer electrolytes as proven in differential scanning calorimetry (DSC) study. NCPE-based electric double layer capacitors (EDLCs) depict better electrochemical performance than that of filler-free polymer electrolyte as portrayed in cyclic voltammetry (CV) and galvanostatic charge-discharge (GCD) studies. EDLCs comprising of NCPE demonstrate high specific capacitance with low internal resistance. Among all the systems, alumina-based polymer electrolyte is a good candidate to be applied in electrochemical device. This system achieves the maximum ionic conductivity of  $2.30 \text{ mS cm}^{-1}$  at ambient temperature. The fabricated EDLC using this system also achieves the maximum specific capacitance of  $7.55 \text{ F g}^{-1}$  (or equivalent to  $90.54 \text{ mF cm}^{-2}$ ), energy density of  $0.95 \text{ W h kg}^{-1}$  and power density of  $41.15 \text{ W kg}^{-1}$  as shown in charge-discharge curve.

### Biography

Ramesh T Subramaniam completed his PhD from University of Malaya, Malaysia in the field of Advanced Materials. His accomplishment in the area of green polymer electrolytes has earned him the recognition as a prominent researcher in this field. He has received many awards and recognition namely TWAS Young Affiliate Fellow for the period 2009-2013, Pacificchem Young Scholar Award 2010, Young Scientist Award 2011 from IUPAC, IAP Young Scientist 2012 and GYA Young Scientist 2013. To date, he has published and presented more than 150 papers. He currently has an *h*-index of 18 with total number of citations more than 1000.

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