Seminar

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Strategies for the development of high performance supercapacitors

Electrochemical double layer capacitors (EDLCs), also known as supercapacitors, are today advancing as one of the most promising energy storage technology. In EDLCs the charge is electrostatically stored at the electrode-electrolyte interface and, because of this storage mechanism, these devices can be charged and discharged within seconds. Currently, the commercial available EDLCs contain activated carbon as active material and quaternary ammonium salts in propylene carbonate (PC) or acetonitrile (ACN) as electrolyte. These systems are nowadays conveniently used in a large number of applications where rapid charge-discharge capability and reliability are required.

In order to improve the performance of DLCs the enhancement of the operative voltage is the most effective way to increase the energy of EDLCs. In order to realize systems with high operative voltage, the use of electrolytes with wider electrochemical stability windows (ESWs) compared to the state-of-the-art electrolytes is necessary. For this reason, several types of electrolytes have been proposed in the last years as alternative to conventional electrolytes for the realization of high voltage EDLCs. Generally, the alternative electrolytes proposed so far can be divided in two main categories: ionic liquid (IL) and organic solvent based electrolytes. Electrolytes enabling high operative voltages like IL based electrolytes and displaying viscosities close to that of conventional electrolytes are extremely attractive for the realization of high voltage and high performance EDLCs.

In this presentation, the development of high voltage EDLCs containing two different types of electrolytes will be discussed. The first type of electrolyte is based on a mixture of PC and the ionic liquid N-butyl-N-methylpyrrolidinium bis(trifluoromethanesulfonyl)imide (PYR14TFSI). The second type of electrolyte considered is based on the solvent adiponitrile (AND). The use of both these electrolytes allows the realization of EDLCs able to display at RT an operative voltage of 3.5 V. Moreover, since the influence of the carbon properties on the performance of ADN-based EDLCs has not been investigated in detail, the development of carbon tailored for this promising electrolyte will be also considered.

Tuesday, June 26th, 14h15

Hörsaal Makromolekulare Chemie, Stefan-Meier-Str. 31

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