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Recent advances on the understanding of ion adsorption/transfer in nanoporous carbon electrodes; application to supercapacitors

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本セミナーは，工学研究科グリーンシステム創成科学専攻の「平成 28 年度第 5 回国際セミナー」及び未来工学研究センター研究課題の講演会を兼ねています。万障お繰り合わせの上，ご参加下さい。

Abstract

Electrochemical double layer capacitors are electrochemical energy storage devices that can store energy through electrostatic charges onto activated carbon electrodes. They exhibit performances, in term of power and energy densities, between the secondary batteries and the conventional capacitors — making them suitable for instance for energy harvesting, such as braking energy recovery[1]. Nevertheless, they still suffer from a poor specific energy, thus one main objective these last past years have been to develop new advanced electrode materials such as nanoporous carbons.

As a matter of fact such kind of carbons have raised more and more attention because it has been proven that anomalous specific capacitance was obtained when average pore size is lower than 1nm — it is to say below the solvated ion size[2]. What's more, a maximum capacitance is even reached when pore size matches the ion size[3].

Since then, many researches have been carried out in order to explain such kind of un- expected behavior in nanoporous carbons such as cavity microelectrode studies[4], molec- ular dynamic studies[5, 6, 7], quartz microblance studies without[8] and with NMR[9, 10, 11].

Overall it has been shown that ions are more efficiently stored in nanopores — they are partially desolvated and get closer to the carbon surface — and they move quickly even- though they are confined — the diffusion coefficient is only decreased slightly as compared to the bulk electrolyte. Today's research is focused on developing new nanoporous acti- vated carbons to get access to new enhanced electrochemical double layer capacitors.

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