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FLUORINE-FREE ELECTRODES FOR AQUEOUS SUPERCAPACITORS

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Abstract

Electrochemical capacitors have reached a significant interest in the scientific community over the last few decades due to their outstanding features. They can be charged and discharged within seconds and operate up to million cycles. They may be also considered as environmentally benign devices when operating in neutral aqueous electrolyte, eg. Li_2SO_4, Na_2SO_4, KI. However, carbon electrodes are conventionally bounded by fluorine-based polymers as polytetrafluroethylene (PTFE) and polyvinylidenedifluoride (PVdF) which are highly hydrophobic, hence, aggravating wettability of electrodes. Many efforts have been devoted to overcome this disadvantage and apply more sustainable materials as electrodes binders. Use of cellulose has been recently reported and shown a great opportunity to consider biopolymers as useful substances in terms of carbon binding.[1] This work presents the application of another widely abundant biopolymer, chitin, as binder for carbon electrodes operating in aforementioned electrolytes.

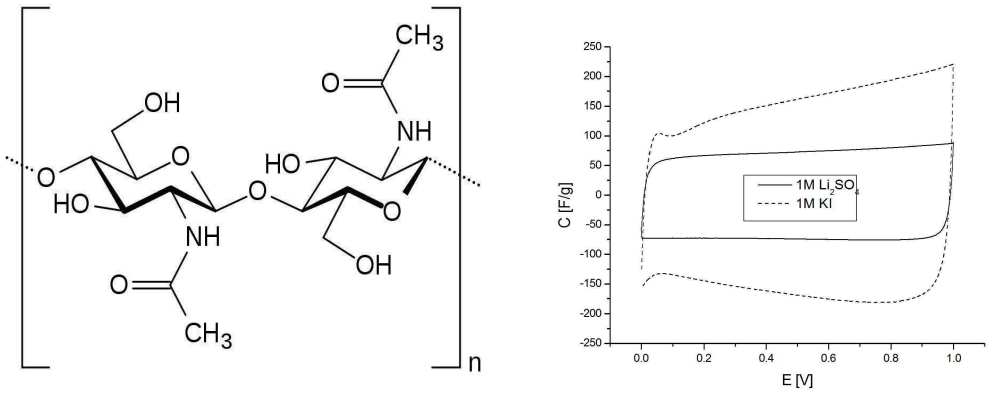

***Figure 1**. Structure of chitin (left) and cyclic voltammograms (20 mV s^{-1}) for chitin-bounded carbon electrodes (NORIT Supra 30) operating in 1M Li_2SO_4 or 1M KI (right).*

Chitin-bounded electrodes show promising performance with satisfactory capacitance values. Moreover, cyclic voltammetry method confirmed good charge propagation across the electrode/electrolyte interface, presumably originating from improved electrode wettability. Cycling studies have shown no significant decrease of capacitance over 20,000 cycles. Thus, chitin appears to be a cheap, eco-friendly alternative for fluoropolymers reflecting promising results and it needs more-in-depth study.

References

[1] N. Bockenfeld, S. S. Jeong, M. Winter, S. Passerini, A. Balducci, *Journal of Power Sources*, 2013, 221, 14-20

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