Functionalized graphene oxide for efficient capacitive deionization

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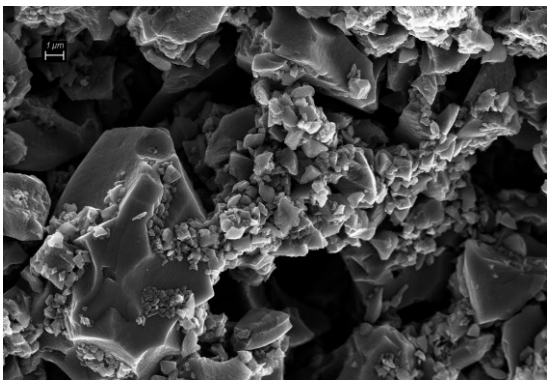
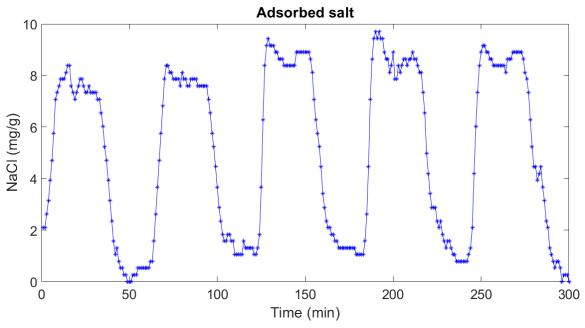
Graphene oxide functionalized with a novel positively charged monomer is proposed for application in water desalination. The functionalized graphene oxide has been obtained by a simple and scalable method, based on a modification of the one recently proposed by Roppolo et al [1]. The material obtained this way has been mixed in organic solvent with activated carbon and hydrophobic polymeric binder to obtain a stable dispersion. The as prepared slurry has been coated on a metallic current collector with the doctor blade method and then dried at 50 °C in order to obtain one of the two final electrodes. The counterpart is obtained by replacing the functionalized graphene oxide with pristine graphene oxide in the previously described preparation. The final device, exploiting high surface asymmetric electrodes with opposite charges, is obtained juxtaposing a pair of these electrodes inside a homemade cell specifically designed for capacitive deionization application. Inlet and outlet are connected to a peristaltic pump. All the capacitive deionization tests have been performed in batch configuration, using NaCl 10 mM. A conductimeter is used for real-time measurement of the solution's conductivity. Material characterization techniques such as electron microscopy and infrared spectroscopy are employed to study the physical and chemical structure of the proposed materials. Thermogravimetric analysis is used to investigate the effectiveness of the functionalization procedure. Electrochemical methods are chosen to evaluate the efficiency of salt removal from water. The final device demonstrates a remarkable desalination performance, reaching values higher than 8 mg/g of salt removal, while showing a stunning charge efficiency above 98%.





References
1. Roppolo, I. et al., *Carbon* **2014**, *77*, 226-235.