Electro-Spun Graphene-Enriched Carbon Fibres for Electrochemical Deionisation of Water

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The ever-growing demand of fresh water has encouraged the development of a variety of desalting techniques of seawater. The capacitive deionization (CDI) method is one of the most attractive among them [1] because of its environmental friendliness and the low operation potential (1.0−1.2 V). Different high surface area nanocarbons, such as carbon nanotubes, carbon aerogel, graphene (G), and activated carbon, have been successfully utilized to fabricate the electrodes in CDI cells.[1]
This contribution deals with synthesis, analysis and testing, as electrode materials in CDI cells, of G-enriched C fibres (GCFs), and reference C fibres (CFs). GCFs and CFs are prepared via electro-spinning (ES), an inexpensive and scalable technique for the synthesis of low-dimensionality materials.[2]
The spinnable solution is prepared using polyacrylonitrile (polymer) and N,N-dimethyl-formamide (solvent). Graphene oxide (GO) is added in the case of GCFs. After stabilization in air and carbonization in helium, a paper-like membrane is obtained (Fig.1a), consisting of N-doped fibres with 360 nm average diameters (Fig.1b).

The electrochemical behaviour is evaluated by cyclic voltammetry (CV) using a three-electrode cell (Fig.2). Data collected in 0.1 mol/l NaCl solution with -1−0.5 V potentials demonstrated that, under the same conditions, GCFs exhibit improved electro-chemical performances with respect to CFs.

References

[1] S. Porada, R. Zhao, A. van der Wal et al., Progr. Mater. Sci., 58 (2013) 1388
[2] G. Faggio, V. Modafferi, G. Panzera et al., J Raman Spectr., 43 (2012) 761

Figures

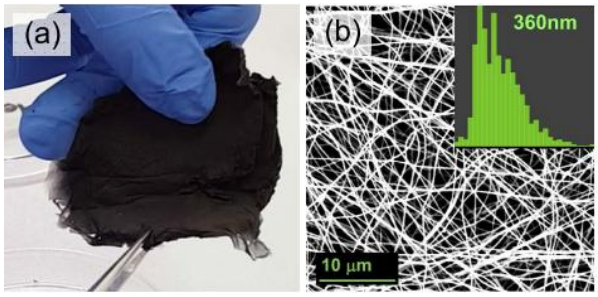

Figure 1: (a) Paper-like membrane and (b) SEM image and diameter distribution of the CFs

Figure 2: Three-electrode cell for CDI tests.