

the wet coatings were dried at 100° C. for 2 hours to remove excess solvent, followed by 120° C. under dynamic vacuum to expel remaining traces of solvent. After evaporation of the solvent thin composite films were obtained.

The electrodes of geometrical area of 1 cm² were assembled into cells with a TR-PAN based anode. A porous glass fibre (Whatman), Celgard 3501 or PTFE based separator was used to electronically separate the cathode from the anode, and either 1M LiBF₄ (lithium tetrafluoroborate) and tetraethyl ammonium tetrafluoroborate (NEt₄BF₄) in propylene carbonate (PC) or 1.5M LiBF₄ in γ -butyrolactone/ethylene carbonate (GB/EC) mixture was used as the electrolyte. Ink preparation and cell assembly were carried out in a dry room.

Cell Test Data

A formation step was carried out before cycling. This was achieved by applying a constant current of 0.2 mA for 10 cycles between voltage limits of 0 V and 2.5 V.

Following formation, the cell was cycled at constant currents varying from 1 mA to 60 mA. FIG. 10 again shows the variation of electrode capacitance with current density. The unit capacitance at all cycling currents was significantly less than observed in the cells with a Li⁺ sink in the anode. For instance at a current density of 10 mA cm⁻² a unit capacitance of 0.1 F cm⁻² was delivered compared with 0.25 F cm⁻² for the cell with the anode sink.

CONCLUSION

The cell with the anode sink delivered more than twice the capacitance of the cell without for the same electrode loadings.

The invention claimed is:

1. A process for forming an electrode material comprising a complexing step of causing lithium sulphite to form SO₃ complexes at active N sites of a nitrogen-carbon structure, in

the presence of a selected amount of a sink that absorbs the liberated lithium, so as to form the N:SO₃ complexed electrode material.

2. A process as claimed in claim 1, wherein the nitrogen-carbon structure is thermally restructured polyacrylonitrile (TR-PAN) or a copolymer thereof.

3. A process as claimed in claim 1, wherein lithium sulphite is used roughly in an equimolar ratio with the amount of active N sites in the nitrogen-carbon structure.

4. A process as claimed in claim 1, wherein the amount of the sink is selected based on the amount of lithium sulphite used.

5. A process as claimed in claim 1, wherein the sink is a metal oxide selected from the group consisting of CuO, SnO, and NiO.

6. A process as claimed in claim 1, wherein the complexing step is conducted as an electrochemical formation step in a supercapacitor cell, wherein the nitrogen-carbon structure and lithium sulphite is located in a first electrode and the sink is located in a counterelectrode that absorbs the lithium during the complexing step.

7. A symmetric supercapacitor produced by the process of claim 6, wherein the supercapacitor is subsequently formed from a pair of electrodes, each of which is a first electrode.

8. A process as claimed in claim 1, wherein the complexing step is conducted as a chemical reaction between lithium sulphite and the sink in an aqueous solution in the presence of the nitrogen-carbon structure.

9. A process as claimed in claim 1, wherein the N:SO₃ complexed electrode material is subsequently used to form a supercapacitor.

10. An asymmetric supercapacitor produced by the process of claim 6, wherein the supercapacitor is formed from the said first electrode and said counterelectrode.

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