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(54) Title: ELECTROLESS DEPOSITION OF NANOSCALE MANGANESE OXIDE ON ULTRAPOROUS CARBON NANOARCHITECTURES

(57) **Abstract:** A method of forming a composite comprising the steps of providing a porous carbon structure comprising a surface and pores and infiltrating the structure with a coating comprising MnO_2 without completely filling or obstructing a majority of the pores. A method of storing charge comprising the steps of providing a capacitor comprising an anode, a cathode, and an electrolyte, wherein the anode, the cathode, or both comprise a composite comprising a porous carbon structure comprising a surface and pores and a coating on the surface comprising MnO_2 wherein the coating does not completely fill or obstruct a majority of the pores and a current collector in electrical contact with the composite, and charging the capacitor.

AMENDED CLAIMS

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1. A method of forming a composite comprising the steps of: providing a prefabricated electrode structure comprising a surface and pores; infiltrating the structure with a coating comprising MnO_2 without completely filling or obstructing a majority of the pores.

2. The method of claim 1, wherein cations and water are incorporated within the MnO_2.

3. The method of claim 2, wherein the structure is a carbon aerogel.

4. The method of claim 2, wherein the structure is selected from the group consisting of carbon nanofoam, xerogel, templated mesoporous carbon, templated macroporous carbon, and carbon nanotube/nanofiber assemblies.

5. The method of claim 1, wherein the pores have an average diameter of from about 2 nm to about 1 μm.

6. The method of claim 1, wherein the coating has a thickness of less than about 50 nm.

7. The method of claim 1, wherein the coating has a thickness of less than about 10 nm.

8. The method of claim 1, wherein the infiltrating step comprises self-limiting electroless deposition.

9. A method of storing charge comprising the steps of: providing a capacitor comprising an anode, a cathode, and an electrolyte, wherein the anode, the cathode, or both comprise: a composite comprising a prefabricated electrode structure comprising a surface and pores; and a coating on the surface comprising MnO_2; wherein the coating does not completely fill or obstruct a majority of the pores; and a current collector in electrical contact with the composite; and charging the capacitor.

10. The method of claim 9, wherein cations and water are incorporated within the MnO_2.

11. The method of claim 10, wherein the structure is a carbon aerogel.

12. The method of claim 11, wherein the structure is selected from the group consisting of carbon nanofoam, xerogel, templated mesoporous carbon, templated macroporous carbon, and carbon nanotube/nanofiber assemblies.

13. The method of claim 11, wherein the pores have an average diameter of from about 2 nm to about 1 μm.

14. The method of claim 10, wherein the coating has a thickness of less than about 50 nm.

15. The method of claim 11, wherein the coating has a thickness of less than about 10 nm.

16. The method of claim 10, wherein the electrolyte comprises aqueous sodium sulfate.

17. The method of claim 10, wherein the electrolyte comprises an aqueous, nominally neutral (pH 6–8) electrolyte with or without buffering components.

18. The method of claim 10, wherein the electrolyte comprises a liquid selected from the group consisting of an aqueous, basic (pH >8) electrolyte with or without buffering components.

19. The method of claim 10, wherein the electrolyte comprises a liquid selected from the group consisting of a nonaqueous liquid of sufficient dielectric constant to dissociate salts soluble in the nonaqueous liquid.

20. The method of claim 10, wherein the coating is formed by self-limiting electroless deposition.