Claims

1. An anode comprising a three dimensional boron-doped carbon nanotube foam, wherein an active material is embedded into the pores of the foam, wherein up to 99% of a pore volume of the foam is incorporated with the active material.

2. The anode of Claim 1, wherein the anode is formed on or adhered to a metal foil.

3. The anode of Claim 2, wherein the metal foil is a copper foil or an aluminum foil.

4. The anode of Claim 1, wherein the active material is selected from the group consisting of lithium metal, a material that reversibly intercalates/deintercalates lithium ions, a lithium metal alloy, a material capable of doping and dedoping lithium, or a transition metal oxide.

5. The anode of Claim 1, wherein the active material is lithium metal or an alloy comprising lithium.

6. The anode of Claim 1, wherein the three dimensional boron-doped carbon nanotube foam is formed using a CVD process, wherein the foam is formed on a metal foil.

7. A cathode comprising a three dimensional boron-doped carbon nanotube foam, wherein an active material is embedded into the pores of the foam, wherein up to 99% of a pore volume of the foam is incorporated with the active material.

8. The cathode of Claim 7, wherein the cathode is formed on or adhered to a metal foil.

9. The cathode of Claim 8, wherein the metal foil is a copper foil or an aluminum foil.

10. The cathode of Claim 7, wherein the active material is selected from the group consisting of lithium oxide, lithium sulfide, $LiPF_6$, $LiClO_4$, $LiAsF_6$, $LiBF_4$, $LiSbF_6$, $LiAlO_4$, $LiAlCl_4$, $LiCF_3SO_3$, $LiC_4F_9SO_3$, $LiN(C_2F_5SO_3)$ 2, $LiN(C_2F_5SO_2)_2$, $LiN(CF_3SO_2)_2$, LiCl, LiI, $LiB(C_2O_4)_2$, $LiCoO_2$, $LiMn_2O_4$, $LiFePO_4$, $Li_{1-x}Fe_xPO_4$ ($0\leq x\leq 1$), $Li[Mn_{2-x}M_x]O_4$ (M=Co, Ni, Cr, Al, Mg, $0\leq x\leq 0.1$), $Li_aCoM_aO_2$, $Li_{1-b}CoM'_yO_2$ (M and M' represent W, Mo, Zr, Ti, Mg, Ta, Al, Fe, V, Cr, and/or Nb; $1\leq a\leq 1.2$, $0<b\leq 0.05$, $0\leq x\leq 0.02$ and $0\leq y\leq 0.02$), $LiNiO_2$, $LiNiMnCoO_2$, Li_2FePO_4F, $LiCo_{0.33}Ni_{0.33}Mn_{0.33}O_2$, $Li(Li_aNi_xMn_yCo_z)O_2$ (also known as NMC), $LiNiCoAlO_2$, $Li_4Ti_5O_{12}$, $Li_3V_2(PO_4)_3$, and combinations thereof.

11. The cathode of Claim 7, wherein the active material is lithium oxide or lithium sulfide.

12. The cathode of Claim 7, wherein the three dimensional boron-doped carbon nanotube foam is formed using a CVD process, wherein the foam is formed on a metal foil.

13. A battery comprising an anode of any of Claims 1-6.

14. A battery comprising a cathode of any of Claims 7-12.

15. A capacitor or supercapacitor comprising an anode of any of Claims 1-6.

16. A capacitor or supercapacitor comprising a cathode of any of Claims 7-12.