What is claimed is:

1. A lithium ion cell comprising:

a negative electrode comprising from 75 wt% to 92 wt% an active material, from 1 wt% to 7 wt% nanoscale conductive carbon and from 6 wt % to 20 wt% polymer binder, wherein the active material comprises from 35 wt% to 95 wt% silicon oxide-based material and from 5 wt% to 65 wt% graphite;

a positive electrode comprising a lithium nickel cobalt manganese oxide approximately represented by the formula $LiNi_xMn_yCo_zO_2$, where $x + y + z \approx 1$, $0.3 \leq x$, $0.025 \leq y \leq 0.35$, $0.025 \leq z \leq 0.35$, conductive carbon, and a polymer binder;

a separator between the negative electrode and the positive electrode;

electrolyte comprising from 1M to 2 M lithium salt and non-aqueous solvent, wherein the non-aqueous solvent comprises from 5 volume percent to 20 volume percent fluoroethylene carbonate, at least 25 volume percent combined amount of dimethyl carbonate, and methyl ethyl carbonate, and from 20 volume percent to 50 volume percent diethyl carbonate; and a container enclosing the other cell components.

2. The lithium ion cell of claim 1 wherein the lithium ion cell can be cycled at a charge rate of 1C and a discharge rate of 1C for at least about 700 cycles without a drop in capacity of more than 20% relative to the 3rd cycle capacity.

3. The lithium ion cell of claim 1 or claim 2 wherein the negative electrode active material comprises from 40 wt% to 90 wt% silicon-oxide based material and from 10 wt% to 60 wt% graphite, wherein the graphite has a BET surface area from 2 m^2/g to 100 m^2/g

4. The lithium ion cell of claim 3 wherein the silicon oxide-based material comprises a silicon-silicon oxide carbon composite material.

5. The lithium ion cell of any one of claims 1-4 wherein the polymer binder of the negative electrode comprises a blend of polyimide and a second binder polymer selected from the group consisting of poly vinylidene fluoride, carboxymethyl cellulose, styrene-butadiene rubber, lithiated polyacrylic acid, copolymers thereof and mixtures thereof.

6. The lithium ion cell of any one of claims 1-5 wherein the electrolyte comprises from 1.25 M to 1.8 M lithium salt and wherein the non-aqueous solvent comprises from 8 volume percent to 25 volume percent fluoroethylene carbonate and at least 50 volume percent combined amount of dimethyl carbonate, methyl ethyl carbonate, and diethyl carbonate, and wherein the electrolyte is substantially free of ethylene carbonate.

7. The lithium ion cell of any one of claims 1-5 wherein the electrolyte further comprises from 2 wt% to 12 wt% of propylene carbonate and from 2 wt% to 12 wt% of fluorobenzene.

8. The lithium ion cell of any one of claims 1-7 wherein the lithium nickel manganese cobalt oxide is approximately represented by the formula $LiNi_xMn_yCo_zO_2$, where $x + y + z \approx 1$, $0.50 \leq x$, $0.03 \leq y \leq 0.325$, $0.03 \leq z \leq 0.325$.

9. The lithium ion cell of any one of claims 1-8 further comprising supplemental lithium in an amount from 80% to 180% of the negative electrode first cycle irreversible capacity loss, the lithium ion cell having a ratio at the fourth cycle at a discharge rate of C/3 of negative electrode capacity divided by the positive electrode capacity from 1.10 to 1.95.

10. The lithium ion cell of any one of claims 1-9 wherein the positive electrode further comprises from 20 wt% to 80 wt% of (lithium + manganese) rich lithium metal oxide represented by the formula $Li_{1+b}Ni_\alpha Mn_\beta Co_\gamma A_\delta O_{2-z}F_z$, where $b + \alpha + \beta + \gamma + \delta \approx 1$, b ranges from 0.04 to 0.3, α ranges from 0 to 0.4, β range from 0.2 to 0.65, γ ranges from 0 to 0.46, δ ranges from about 0 to 0.15 and z ranges from 0 to 0.2, with the proviso that both α and γ are not 0, and where A is a metal different from lithium, manganese, nickel and cobalt.

11. A lithium ion cell comprising:

a negative electrode comprising from 75 wt% to 92 wt% an active material, from 1 wt% to 7 wt% nanoscale conductive carbon and from 6 wt % to 20 wt% polymer binder, wherein the active material comprises from 40 wt% to 95 wt% silicon oxide-based material and from 5 wt% to 60 wt% graphite;

a positive electrode comprising a nickel-rich lithium nickel cobalt metal oxide, conductive carbon, and a polymer binder, where the nickel-rich lithium nickel cobalt metal oxide is approximately represented by the formula $LiNi_xM_yCo_zO_2$, where $x + y + z \approx 1$, $0.3 \leq x$, $0.025 \leq y \leq 0.35$, $0.025 \leq z \leq 0.35$ and M is Mn, Al, Mg, Sr, Ba, Cd, Zn, Ga, B, Zr, Ti, Ca, Ce, Y, Nb, Cr, Fe, V, or combinations thereof;

a separator between the negative electrode and the positive electrode;

electrolyte comprising from 1M to 2 M lithium salt and non-aqueous solvent, wherein the non-aqueous solvent comprises from 5 volume percent to 20 volume percent fluoroethylene carbonate, at least 25 volume percent combined amount of dimethyl carbonate and methyl ethyl carbonate, and from 20 volume percent to 50 volume percent diethyl carbonate; and a container enclosing the other cell components,

wherein the lithium ion cell can be cycled at a charge rate of 1C and a discharge rate of 1C for at least 700 cycles without a drop in capacity of more than 20% relative to the 3rd cycle capacity.

12. The lithium ion cell of claim 11 wherein the lithium ion cell can be cycled at a charge rate of 1C and a discharge rate of 1C for at least about 750 cycles without a drop in capacity of more than 20% relative to the 3rd cycle capacity.

13. The lithium ion cell of claim 11 or claim 12 wherein the negative electrode active material comprises from 50 wt% to 90 wt% silicon-oxide based material and from 10 wt% to 50 wt% graphite, wherein the graphite has a BET surface area from 2 m^2/g to 100 m^2/g

14. The lithium ion cell of claim 13 wherein the silicon oxide-based material comprises a silicon-silicon oxide carbon composite material.

15. The lithium ion cell of any one of claims 11-14 wherein the polymer binder of the negative electrode comprises a blend of polyimide and a second binder polymer selected from the group consisting of poly vinylidene fluoride, carboxymethyl cellulose, styrene-butadiene rubber, lithiated polyacrylic acid, copolymers thereof and mixtures thereof.

16. The lithium ion cell of any one of claims 11-15 wherein the electrolyte comprises from 1.25 M to 1.8 M lithium salt and wherein the non-aqueous solvent comprises from 8 volume percent to 25 volume percent fluoroethylene carbonate and at least 50 volume percent combined amount of dimethyl carbonate, methyl ethyl carbonate, and diethyl carbonate.

17. The lithium ion cell of any one of claims 11-15 wherein the electrolyte further comprises from 2 wt% to 12 wt% of propylene carbonate and from 2 wt% to 12 wt% of fluorobenzene.

18. The lithium ion cell of any one of claims 11-17 wherein the lithium nickel metal cobalt oxide is approximately represented by the formula $LiNi_xMn_yCo_zO_2$, where $x + y + z \approx 1$, $0.50 \leq x$, $0.03 \leq y \leq 0.325$, $0.03 \leq z \leq 0.325$.

19. The lithium ion cell of any one of claims 11-18 further comprising supplemental lithium in an amount from 80% to 180% of the negative electrode first cycle irreversible capacity loss, the lithium ion cell having a ratio at the fourth cycle at a discharge rate of C/3 of negative electrode capacity divided by the positive electrode capacity from 1.10 to 1.95.

20. The lithium ion cell of any one of claims 11-19 wherein the lithium ion cell can be cycled at a charge rate of 1C and a discharge rate of 1C for at least about 800 cycles without a drop in capacity of more than 20% relative to the 3rd cycle capacity.