What is claimed is:

1. A lithium ion cell comprising:

a negative electrode comprising from ~~about~~ 75 wt% to ~~about~~ 92 wt% an active material, from ~~about~~ 1 wt% to ~~about~~ 7 wt% nanoscale conductive carbon and from ~~about~~ 6 wt % to ~~about~~ 20 wt% polymer binder, wherein the active material comprises from ~~about~~ 35 wt% to ~~about~~ 95 wt% silicon oxide-based material and from ~~about~~ 5 wt% to ~~about~~ 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 ~~about~~ 1M to ~~about~~ 2 M lithium salt and non-aqueous solvent, wherein the non-aqueous solvent comprises from~~at least about~~ 5 volume percent to 20 volume percent fluoroethylene carbonate~~, and~~ at least ~~about~~ 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 ~~about~~ 40 wt% to ~~about~~ 90 wt% silicon-oxide based material and from ~~about~~ 10 wt% to ~~about~~ 60 wt% graphite, wherein the graphite has a BET surface area from ~~about~~ 2 m^2/g to ~~about~~ 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 ~~about~~ 1.25 M to ~~about~~ 1.8 M lithium salt and wherein the non-aqueous solvent comprises from ~~about~~ 8 volume percent to ~~about~~ 25 volume percent fluoroethylene carbonate and at least ~~about~~ 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 ~~about~~ 2 wt% to ~~about~~ 12 wt% of propylene carbonate and from ~~about~~ 2 wt% to ~~about~~ 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 ~~about~~ 80% to ~~about~~ 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 ~~about~~ 1.10 to ~~about~~ 1.95.

10. The lithium ion cell of any one of claims 1-9 wherein the positive electrode further comprises from ~~about~~ 20 wt% to ~~about~~ 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 ~~about~~ 0.04 to ~~about~~ 0.3, α ranges from 0 to ~~about~~ 0.4, β range from ~~about~~ 0.2 to ~~about~~ 0.65, γ ranges from 0 to ~~about~~ 0.46, δ ranges from about 0 to ~~about~~ 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 ~~about~~ 75 wt% to ~~about~~ 92 wt% an active material, from ~~about~~ 1 wt% to ~~about~~ 7 wt% nanoscale conductive carbon and from ~~about~~ 6 wt % to ~~about~~ 20 wt% polymer binder, wherein the active material comprises from ~~about~~ 40 wt% to ~~about~~ 95 wt% silicon oxide-based material and from ~~about~~ 5 wt% to ~~about~~ 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 ~~cobalt~~ 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 ~~about~~ 1M to ~~about~~ 2 M lithium salt and non-aqueous solvent, wherein the non-aqueous solvent comprises from~~at least about~~ 5 volume percent to 20 volume percent fluoroethylene carbonate~~, and~~ at least ~~about~~ 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 ~~about~~ 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 ~~about~~ 50 wt% to ~~about~~ 90 wt% silicon-oxide based material and from

~~about~~ 10 wt% to ~~about~~ 50 wt% graphite, wherein the graphite has a BET surface area from ~~about~~ 2 m^2/g to ~~about~~ 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 ~~about~~ 1.25 M to ~~about~~ 1.8 M lithium salt and wherein the non-aqueous solvent comprises from ~~about~~ 8 volume percent to ~~about~~ 25 volume percent fluoroethylene carbonate and at least ~~about~~ 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 ~~about~~ 2 wt% to ~~about~~ 12 wt% of propylene carbonate and from ~~about~~ 2 wt% to ~~about~~ 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 ~~about~~ 80% to ~~about~~ 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 ~~about~~ 1.10 to ~~about~~ 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.