CLAIMS

What is claimed is:

1. A cathode for a secondary battery, comprising a current collector and an electrode layer coated on top of the current collector, wherein the electrode layer comprises a cathode active material, a binder material and a lithium compound.

2. The cathode of claim 1, wherein lithium loss of the cathode active material is inhibited by a percentage from about 1 percent to about 15 percent.

3. The cathode of claim 1, wherein the lithium compound comprises one or more of lithium borate, lithium bromide, lithium chloride, lithium hydrogen carbonate, lithium hydroxide, lithium iodide, lithium nitrate, lithium sulfate, lithium acetate, lithium lactate, lithium citrate, lithium succinate or combinations thereof.

4. The cathode of claim 1, wherein the cathode active material is selected from the group consisting of $Li_{1+x}Ni_aMn_bCo_cAl_{(1-a-b-c)}O_2$, $LiNi_{0.33}Mn_{0.33}Co_{0.33}O_2$, $LiNi_{0.4}Mn_{0.4}Co_{0.2}O_2$, $LiNi_{0.5}Mn_{0.3}Co_{0.2}O_2$, $LiNi_{0.6}Mn_{0.2}Co_{0.2}O_2$, $LiNi_{0.7}Mn_{0.15}Co_{0.15}O_2$, $LiNi_{0.8}Mn_{0.1}Co_{0.1}O_2$, $LiNi_{0.92}Mn_{0.04}Co_{0.04}O_2$, $LiNi_{0.8}Co_{0.15}Al_{0.05}O_2$, $LiCoO_2$, $LiNiO_2$, $LiMnO_2$, $LiMn_2O_4$, Li_2MnO_3, and combinations thereof; wherein $-0.2\leq x\leq 0.2$, $0\leq a<1$, $0\leq b<1$, $0\leq c<1$, and $a+b+c\leq 1$; and wherein the cathode active material is doped with a dopant selected from the group consisting of Fe, Ni, Mn, Al, Mg, Zn, Ti, La, Ce, Sn, Zr, Ru, Si, Ge, and combinations thereof.

5. The cathode of claim 1, wherein the cathode active material comprises or is a core-shell composite comprising a core comprising a lithium transition metal oxide as claimed in claim 4 and the shell comprises a lithium transition metal oxide different to the core and is selected from the group consisting of $Li_{1+x}Ni_aMn_bCo_cAl_{(1-a-b-c)}O_2$, $LiCoO_2$, $LiNiO_2$, $LiMnO_2$, $LiMn_2O_4$, Li_2MnO_3, $LiCrO_2$, $Li_4Ti_5O_{12}$, LiV_2O_5, $LiTiS_2$, $LiMoS_2$, and combinations thereof, wherein $-0.2\leq x\leq 0.2$, $0\leq a<1$, $0\leq b<1$, $0\leq c<1$, and $a+b+c\leq 1$; and wherein each of the core and shell is independently doped with a dopant selected from the group consisting of Fe, Ni, Mn, Al, Mg, Zn, Ti, La, Ce, Sn, Zr, Ru, Si, Ge, and combinations thereof.

6. The cathode of claim 1, wherein the electrode layer further comprises a conductive agent that is selected from the group consisting of carbon, carbon black, graphite, expanded graphite, graphene, graphene nanoplatelets, carbon fibers, carbon nano-fibers, graphitized carbon flake, carbon tubes, carbon nanotubes, activated carbon, mesoporous carbon and combinations

thereof.

7. The cathode of claim 1, wherein the binder material is a polymer comprising one or more functional groups containing a halogen, O, N, S or a combination thereof.

8. The cathode of claim 7, wherein the one or more functional groups are selected from the group consisting of alkoxy, aryloxy, nitro, thiol, thioether, imine, cyano, amide, amino (primary, secondary or tertiary), carboxyl, ketone, aldehyde, ester, hydroxyl and combinations thereof.

9. The cathode of claim 1, wherein the electrode layer has a lithium ion content between 0.01 percent and 20 percent, based on the total weight of the electrode layer.

10. A cathode slurry for a secondary battery, comprising a cathode active material, a binder and a lithium compound.

11. The cathode slurry of claim 10, wherein the lithium compound comprises one or more of lithium borate, lithium bromide, lithium chloride, lithium hydrogen carbonate, lithium hydroxide, lithium iodide, lithium nitrate, lithium sulfate, lithium acetate, lithium lactate, lithium citrate, lithium succinate or combinations thereof.

12. The cathode slurry of claim 10, wherein the cathode active material is selected from the group consisting of $Li_{1+x}Ni_aMn_bCo_cAl_{(1-a-b-c)}O_2$, $LiNi_{0.33}Mn_{0.33}Co_{0.33}O_2$, $LiNi_{0.4}Mn_{0.4}Co_{0.2}O_2$, $LiNi_{0.5}Mn_{0.3}Co_{0.2}O_2$, $LiNi_{0.6}Mn_{0.2}Co_{0.2}O_2$, $LiNi_{0.7}Mn_{0.15}Co_{0.15}O_2$, $LiNi_{0.8}Mn_{0.1}Co_{0.1}O_2$, $LiNi_{0.92}Mn_{0.04}Co_{0.04}O_2$, $LiNi_{0.8}Co_{0.15}Al_{0.05}O_2$, $LiCoO_2$, $LiNiO_2$, $LiMnO_2$, $LiMn_2O_4$, Li_2MnO_3, and combinations thereof; wherein $-0.2\leq x\leq 0.2$, $0\leq a<1$, $0\leq b<1$, $0\leq c<1$, and $a+b+c\leq 1$; and wherein the cathode active material is doped with a dopant selected from the group consisting of Fe, Ni, Mn, Al, Mg, Zn, Ti, La, Ce, Sn, Zr, Ru, Si, Ge, and combinations thereof.

13. The cathode slurry of claim 10, wherein the cathode active material comprises or is a core-shell composite comprising a core comprising a lithium transition metal oxide as claimed in claim 12 and the shell comprises a lithium transition metal oxide different to the core and is selected from the group consisting of $Li_{1+x}Ni_aMn_bCo_cAl_{(1-a-b-c)}O_2$, $LiCoO_2$, $LiNiO_2$, $LiMnO_2$, $LiMn_2O_4$, Li_2MnO_3, $LiCrO_2$, $Li_4Ti_5O_{12}$, LiV_2O_5, $LiTiS_2$, $LiMoS_2$, and combinations thereof, wherein $-0.2\leq x\leq 0.2$, $0\leq a<1$, $0\leq b<1$, $0\leq c<1$, and $a+b+c\leq 1$; and wherein each of the core and shell is independently doped with a dopant selected from the group consisting of Fe, Ni, Mn, Al, Mg, Zn, Ti, La, Ce, Sn, Zr, Ru, Si, Ge, and combinations thereof.

14. The cathode slurry of claim 10, further comprising a conductive agent that is selected from the group consisting of carbon, carbon black, graphite, expanded graphite, graphene, graphene nanoplatelets, carbon fibers, carbon nano-fibers, graphitized carbon flake, carbon tubes, carbon nanotubes, activated carbon, mesoporous carbon and combinations thereof.

15. The cathode slurry of claim 10, wherein the binder material is a polymer comprising one or more functional groups containing a halogen, O, N, S or a combination thereof.

16. The cathode slurry of claim 14, wherein the one or more functional groups are selected from the group consisting of alkoxy, aryloxy, nitro, thiol, thioether, imine, cyano, amide, amino (primary, secondary or tertiary), carboxyl, ketone, aldehyde, ester, hydroxyl and combinations thereof.

17. The cathode slurry of claim 10, wherein the concentration of lithium ions in the cathode slurry is from about 0.0001 M to about 1 M.

18. The cathode slurry of claim 10, wherein the cathode slurry has a pH from about 8 to about 14, or from about 11 to about 13.

19. The cathode slurry of claim 10, wherein lithium loss of the cathode active material is inhibited by a percentage from about 1 percent to about 15 percent.