

CLAIMS

What is claimed is:

1. An electrode assembly for a nonaqueous electrolyte secondary battery, comprising at least one anode, at least one cathode and at least one separator interposed between the at least one anode and at least one cathode, wherein the at least one anode comprises an anode current collector and an anode electrode layer, and the at least one cathode comprises a cathode current collector and a cathode electrode layer, wherein each of the cathode and anode electrode layers independently has a void volume of less than 35%, and wherein each of the at least one cathode and anode independently has a peeling strength of 0.15 N/cm or more.
2. The electrode assembly of claim 1, wherein the surface roughness of each of the cathode and anode current collectors is independently 2 μm or less, or 1 μm or less.
3. The electrode assembly of claim 1, wherein the density of each of the cathode and anode electrode layers is independently from about 1.0 g/m³ to about 6.5 g/m³.
4. The electrode assembly of claim 1, wherein the density of each of the cathode and anode electrode layers is independently from about 1.0 g/m³ to about 3.0 g/m³.
5. The electrode assembly of claim 1, wherein the thickness of each of the cathode and anode electrode layers is independently from about 1.0 μm to about 40 μm .
6. The electrode assembly of claim 1, wherein the thickness of each of the cathode and anode electrode layers is independently from about 1.0 μm to about 25 μm .
7. The electrode assembly of claim 1, wherein the cathode electrode layer comprises a cathode material, a binder material and a conductive agent, and the anode electrode layer comprises an anode material, a binder material and a conductive agent, and wherein each of the binder materials in the cathode and anode electrode layers is independently selected from the group consisting of styrene-butadiene rubber, acrylated styrene-butadiene rubber, acrylonitrile copolymer, acrylonitrile-butadiene rubber, nitrile butadiene rubber, acrylonitrile-styrene-butadiene copolymer, acryl rubber, butyl rubber, fluorine rubber, polytetrafluoroethylene, polyethylene, polypropylene, ethylene/propylene copolymers, polybutadiene, polyethylene oxide, chlorosulfonated polyethylene, polyvinylpyrrolidone,

polyvinylpyridine, polyvinyl alcohol, polyvinyl acetate, polyepichlorohydrin, polyphosphazene, polyacrylonitrile, polystyrene, latex, acrylic resins, phenolic resins, epoxy resins, carboxymethyl cellulose, hydroxypropyl cellulose, cellulose acetate, cellulose acetate butyrate, cellulose acetate propionate, cyanoethylcellulose, cyanoethylsucrose, polyester, polyamide, polyether, polyimide, polycarboxylate, polycarboxylic acid, polyacrylic acid, polyacrylate, polymethacrylic acid, polymethacrylate, polyacrylamide, polyurethane, fluorinated polymer, chlorinated polymer, a salt of alginic acid, polyvinylidene fluoride, poly(vinylidene fluoride)-hexafluoropropene, and combinations thereof.

8. The electrode assembly of claim 7, wherein each of the binder materials in the cathode and anode electrode layers is independently present in an amount from 2% to 10% by weight, based on the total weight of the cathode or anode electrode layer.

9. The electrode assembly of claim 1, wherein the cathode electrode layer comprises a cathode material selected from the group consisting of LiCoO_2 , LiNiO_2 , $\text{LiNi}_x\text{Mn}_y\text{O}_2$, $\text{Li}_{1+z}\text{Ni}_x\text{Mn}_y\text{Co}_{1-x-y}\text{O}_2$, $\text{LiNi}_x\text{Co}_y\text{Al}_z\text{O}_2$, LiV_2O_5 , LiTiS_2 , LiMoS_2 , LiMnO_2 , LiCrO_2 , LiMn_2O_4 , LiFeO_2 , LiFePO_4 , $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$, $\text{LiNi}_{0.4}\text{Mn}_{1.6}\text{O}_4$, and combinations thereof, wherein each x is independently from 0.3 to 0.8; each y is independently from 0.1 to 0.45; and each z is independently from 0 to 0.2.

10. The electrode assembly of claim 9, wherein the cathode material is present in an amount from 60% to 99% by weight, based on the total weight of the cathode electrode layer.

11. The electrode assembly of claim 1, wherein the cathode electrode layer comprises a cathode material, a binder material and a conductive agent, and the anode electrode layer comprises an anode material, a binder material and a conductive agent, and wherein each of the conductive agents in the cathode and anode electrode layers is independently selected from the group consisting of carbon, carbon black, graphite, expanded graphite, graphene, graphene nanoplatelets, carbon fibres, carbon nano-fibers, graphitized carbon flake, carbon tubes, carbon nanotubes, activated carbon, mesoporous carbon, and combinations thereof.

12. The electrode assembly of claim 11, wherein each of the conductive agents in the cathode and anode electrode layers is independently present in an amount from 2% to 10% by weight, based on the total weight of the cathode or anode electrode layer.

13. The electrode assembly of claim 1, wherein the anode electrode layer comprises

an anode material selected from the group consisting of natural graphite particulate, synthetic graphite particulate, Sn particulate, $\text{Li}_4\text{Ti}_5\text{O}_{12}$ particulate, Si particulate, Si-C composite particulate, and combinations thereof.

14. The electrode assembly of claim 13, wherein the anode material is present in an amount from 50% to 99% by weight, based on the total weight of the anode electrode layer.

15. The electrode assembly of claim 1, wherein each of the cathode and anode current collectors is independently stainless steel, titanium, nickel, aluminum, copper, or electrically-conductive resin.

16. The electrode assembly of claim 1, wherein the cathode current collector is an aluminum thin film, and wherein the anode current collector is a copper thin film.

17. The electrode assembly of claim 1, wherein the water content of the electrode assembly is less than 20 ppm, less than 10 ppm, or less than 5 ppm by weight, based on the total weight of the electrode assembly.

18. The electrode assembly of claim 1, wherein the at least one anode and at least one cathode have a water content of less than 20 ppm, less than 10 ppm, or less than 5 ppm by weight, based on the total weight of the at least one anode and at least one cathode.

19. The electrode assembly of claim 1, wherein the at least one separator has a water content of less than 20 ppm, less than 10 ppm, or less than 5 ppm by weight, based on the total weight of the at least one separator.

20. A lithium battery comprising the electrode assembly of claim 1.