CLAIMS

What is claimed is:

1. A binder composition for a secondary battery electrode comprising a copolymer and a dispersion medium, wherein the copolymer comprises a structural unit (a) derived from a monomer containing an acid group selected from the group consisting of carboxylic acid, sulfonic acid, sulfuric acid, phosphonic acid, phosphoric acid, nitric acid, their salts, their derivatives, and combinations thereof; a structural unit (b) derived from a monomer selected from the group consisting of an amide group-containing monomer, a hydroxyl group-containing monomer, and combinations thereof; and a structural unit (c) derived from a monomer selected from the group consisting of a nitrile group-containing monomer, an ether group-containing monomer, an epoxy group-containing monomer, a carbonyl group-containing monomer, a fluorine-containing monomer, and combinations thereof.

2. The binder composition according to claim 1, wherein the carboxylic acid is selected from the group consisting of acrylic acid, methacrylic acid, crotonic acid, 2-butyl crotonic acid, cinnamic acid, maleic acid, maleic anhydride, fumaric acid, itaconic acid, itaconic anhydride, tetraconic acid, 2-ethylacrylic acid, isocrotonic acid, cis-2-pentenoic acid, trans-2-pentenoic acid, angelic acid, tiglic acid, 3,3-dimethyl acrylic acid, 3-propyl acrylic acid, trans-2-methyl-3-ethyl acrylic acid, cis-2-methyl-3-ethyl acrylic acid, 3-isopropyl acrylic acid, trans-3-methyl-3-ethyl acrylic acid, cis-3-methyl-3-ethyl acrylic acid, 2-isopropyl acrylic acid, trimethyl acrylic acid, 2-methyl-3,3-diethyl acrylic acid, 3-butyl acrylic acid, 2-butyl acrylic acid, 2-pentyl acrylic acid, 2-methyl-2-hexenoic acid, trans-3-methyl-2-hexenoic acid, 3-methyl-3-propyl acrylic acid, 2-ethyl-3-propyl acrylic acid, 2,3-diethyl acrylic acid, 3,3-diethyl acrylic acid, 3-methyl-3-hexyl acrylic acid, 3-methyl-3-tert-butyl acrylic acid, 2-methyl-3-pentyl acrylic acid, 3-methyl-3-pentyl acrylic acid, 4-methyl-2-hexenoic acid, 4-ethyl-2-hexenoic acid, 3-methyl-2-ethyl-2-hexenoic acid, 3-tert-butyl acrylic acid, 2,3-dimethyl-3-ethyl acrylic acid, 3,3-dimethyl-2-ethyl acrylic acid, 3-methyl-3-isopropyl acrylic acid, 2-methyl-3-isopropyl acrylic acid, trans-2-octenoic acid, cis-2-octenoic acid, trans-2-decenoic acid, α-acetoxyacrylic acid, β-trans-aryloxyacrylic acid, α-chloro-β-E-methoxyacrylic acid, methyl maleic acid, dimethyl maleic acid, phenyl maleic acid, bromo maleic acid, chloromaleic acid, dichloromaleic acid, fluoromaleic acid, difluoro maleic acid, nonyl hydrogen maleate, decyl hydrogen maleate, dodecyl hydrogen maleate, octadecyl hydrogen maleate, fluoroalkyl hydrogen maleate, maleic anhydride, methyl maleic anhydride, dimethyl maleic anhydride, acrylic anhydride, methacrylic anhydride, methacrolein, methacryloyl chloride, methacryloyl fluoride methacryloyl bromide and combinations thereof.

3. The binder composition according to claim 1, wherein the proportion of structural unit (a) in the copolymer is from about 15% to about 50% by mole, based on the total number of moles of monomeric units in the copolymer in the binder composition.

4. The binder composition according to claim 1, wherein the amide group-containing monomer is selected from the group consisting of acrylamide, methacrylamide, N-methyl methacrylamide, N-ethyl methacrylamide, N-n-propyl methacrylamide, N-isopropyl methacrylamide, isopropyl acrylamide, N-n-butyl methacrylamide, N-isobutyl methacrylamide, N,N-dimethyl acrylamide, N,N-dimethyl methacrylamide, N,N-diethyl acrylamide, N,N-diethyl methacrylamide, N-methylol methacrylamide, N-(methoxymethyl)methacrylamide, N-(ethoxymethyl)methacrylamide, N-(propoxymethyl)methacrylamide, N-(butoxymethyl)methacrylamide, N,N-dimethyl methacrylamide, N,N-dimethylaminopropyl methacrylamide, N,N-dimethylaminoethyl methacrylamide, N,N-dimethylol methacrylamide, diacetone methacrylamide, diacetone acrylamide, methacryloyl morpholine, N-hydroxyl methacrylamide, N-methoxymethyl acrylamide, N-methoxymethyl methacrylamide, N,N'-methylene-bis-acrylamide, N-hydroxymethyl acrylamide and combinations thereof.

5. The binder composition according to claim 1, wherein the proportion of structural unit (b) in the copolymer is from about 4% to about 25% by mole, based on the total number of moles of monomeric units in the copolymer in the binder composition.

6. The binder composition according to claim 1, wherein the nitrile group-containing monomer is selected from the group consisting of acrylonitrile, α-halogenoacrylonitrile, α-alkylacrylonitrile, α-chloroacrylonitrile, α-bromoacrylonitrile, α-fluoroacrylonitrile, methacrylonitrile, α-ethylacrylonitrile, α-isopropylacrylonitrile, α-n-hexylacrylonitrile, α-methoxyacrylonitrile, 3-methoxyacrylonitrile, 3-ethoxyacrylonitrile, α-acetoxyacrylonitrile, α-phenylacrylonitrile, α-tolylacrylonitrile, α-(methoxyphenyl)acrylonitrile, α-(chlorophenyl)acrylonitrile, α-(cyanophenyl)acrylonitrile, vinylidene cyanide and combinations thereof.

7. The binder composition according to claim 1, wherein the proportion of structural unit (c) in the copolymer is from about 46% to about 65% by mole, based on the total number of moles of monomeric units in the copolymer in the binder composition.

8. The binder composition according to claim 1, wherein the dispersion medium is water.

9. The binder composition according to claim 8, wherein the dispersion medium further comprises a hydrophilic solvent selected from the group consisting of ethanol, isopropanol, n-propanol, tert-butanol, n-butanol, dimethylacetamide, dimethylformamide, N-methylpyrrolidone, methyl ethyl ketone, ethyl acetate, butyl acetate and combinations thereof.

10. The binder composition according to claim 1, wherein the molar ratio of the sum of structural unit (a) and structural unit (b) to structural unit (c) within the copolymer of the binder composition is from about 0.5 to about 1.2.

11. The binder composition according to claim 1, wherein the pH of the binder

composition is from about 7 to about 10.

12. The binder composition according to claim 1, wherein the viscosity of the binder composition is from about 5,000 mPa·s to about 25,000 mPa·s.

13. The binder composition according to claim 1, wherein the electrolyte swelling of the binder composition is from about 1% to about 15%.

14. The binder composition according to claim 1, wherein the solid content of the binder composition is from about 1% to about 20% by weight, based on the total weight of the binder composition.

15. The binder composition according to claim 1, wherein the number-average molecular weight of the copolymer in the binder composition is from about 30,000 g/mol to about 100,000 g/mol.

16. The binder composition according to claim 1, wherein the weight-average molecular weight of the copolymer in the binder composition is from about 100,000 g/mol to about 200,000 g/mol.

17. An electrode for a secondary battery, comprising a current collector and an electrode layer coated onto said current collector, wherein said electrode layer comprises an electrode active material, and the binder composition according to claim 1.

18. The binder composition according to claim 1, wherein the adhesive strength between the binder composition and the current collector is from about 1 N/cm to about 10 N/cm.

19. The electrode according to claim 17, wherein the peeling strength between the current collector and the electrode layer is in the range from about 1.0 N/cm to about 8.0 N/cm.

20. The electrode according to claim 17, wherein the electrode layer further comprises a conductive agent.