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 carboxylic acid group-containing monomer, a structural unit (b) derived from an amide group-containing monomer and a structural unit (c) derived from a nitrile group-containing monomer.

2. The binder composition according to claim 1, wherein the carboxylic acid group-containing monomer 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) derived from a carboxylic acid group-containing monomer in the copolymer is from about 33% to about 70% 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 methacrylamide, N-methyl methacrylamide, N-ethyl methacrylamide, N-n-propyl methacrylamide, N-isopropyl methacrylamide, 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, methacryloyl morpholine and combinations thereof.

5. The binder composition according to claim 1, wherein the proportion of structural unit (b) derived from an amide group-containing monomer in the copolymer is from about 10% to about 35% 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) derived from a nitrile group-containing monomer in the copolymer is from about 10% to about 30% 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 comprise a hydrophilic solvent selected from the group consisting of ethanol, isopropanol, n-propanol, tert-butanol, n-butanol, dimethylacetamide (DMAc), dimethylformamide (DMF), N-methylpyrrolidone (NMP), methyl ethyl ketone (MEK), ethyl acetate (EA), butyl acetate (BA) and combinations thereof.

10. The binder composition according to claim 1, wherein the proportion of the sum of structural unit (a) derived from a carboxylic acid group-containing monomer and structural unit (c) derived from a nitrile group-containing monomer in the copolymer is from about 65% to about 90% by mole, based on the total number of moles of monomeric units in the copolymer in the binder composition.

11. The binder composition according to claim 1, wherein the molar ratio of the sum of structural unit (a) derived from a carboxylic acid group-containing monomer and structural unit

(c) derived from a nitrile group-containing monomer to the structural unit (b) derived from an amide group-containing monomer in the copolymer is from about 1 to about 7.

12. The binder composition according to claim 1, wherein the molar ratio of the sum of the structural unit (a) derived from a carboxylic acid group-containing monomer and structural unit (b) derived from an amide group-containing monomer to the structural unit (c) derived from a nitrile group-containing monomer in the copolymer is from about 1 to about 7.

13. The binder composition according to claim 1, wherein the pH of the binder composition is from about 7 to about 9.

14. The binder composition according to claim 1, wherein the viscosity of the binder composition is from about 10,000 mPa·s to about 50,000 mPa·s.

15. The binder composition according to claim 1, wherein the electrolyte swelling of the binder composition is from about 7% to about 10%.

16. The binder composition according to claim 1, wherein the adhesive strength between the binder composition and the current collector is from about 2 N/cm to about 4 N/cm.

17. The binder composition according to claim 1, wherein the solid content of the binder composition is from about 5% to about 10% by weight, based on the total weight of the binder composition.

18. An electrode for a secondary battery, comprising an electrode active material, a conductive agent and the binder composition according to claim 1.

19. The electrode according to claim 18, 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.