CLAIMS

1. A method of making a filter media having a microbiological interception capability, comprising:

combining a charged material directly to a binder material, forming a charged binder material;

combining a core filter media with said charged binder material; and

forming a filter media with said combined core filter media and said charged binder material.

2. The method of claim 1 wherein said step of forming said filter media includes extruding or compression molding said combined core filter media and charged binder into a solid composite or block.

3. The method of claim 2 wherein said core filter media includes an array of adsorbent or absorbent active particles in powder or particulate form, comprising activated carbon, activated alumina, zeolites, diatomaceous earth, silicates, aluminosilicates, titanates, bone char, calcium hydroxyapatite, manganese oxides, iron oxides, magnesia, perlite, talc, polymeric particulates, clay, iodated resins, ion exchange resins, ceramics, super absorbent polymers (SAPs), and combinations thereof.

4. The method of claim 1 wherein said core filter media material comprises fibers including polymers, polyamide, acrylic, acrylonitrile, liquid crystal polymers, ion-exchange resins, engineered resins, cellulose, rayon, lyocell, ramie, wool, silk, glass, metal, ceramic, organic and inorganic fibers or whiskers, or combinations thereof.

5. The method of claim 4 wherein said core filter media includes a combination of fibers with particulate media including: activated carbon, activated alumina, zeolites, diatomaceous earth, silicates, aluminosilicates, titanates, bone char, calcium hydroxyapatite, manganese oxides, iron oxides,

magnesia, perlite, talc, polymeric particulates, clay, iodated resins, ion exchange resins, ceramics, super absorbent polymers (SAPs), or combinations thereof.

6. The method of claim 5 wherein said step of forming said filter media includes forming flat sheet media.

7. The method of claim 6 including rolling, layering, or pleating said flat sheet media.

8. The method of claim 1 wherein said binder material comprises powder, particulate, or fiber form, and includes polyolefins, polyvinyl halides, polyvinyl esters, polyvinyl ethers, polyvinyl alcohols, polyvinyl sulfates, polyvinyl phosphates, polyvinyl amines, polyamides, polyimides, polyoxidiazoles, polytriazols, polycarbodiimides, polysulfones, polycarbonates, polyethers, polyarylene oxides, polyesters, polyarylates, phenol-formaldehyde resins, melamine-formaldehyde resins, formaldehyde-ureas, ethyl-vinyl acetate copolymers, co-polymers and block interpolymers thereof, and combinations thereof.

9. The method of claim 8 wherein variations of said binder materials include hydroxyl, halogen, lower alkyl groups, lower alkoxy groups, and monocyclic aryl groups.

10. The method of claim 8 wherein said polymers include polystyrenes and acrylonitrile-styrene copolymers, styrene-butadiene copolymers, and other non-crystalline or amorphous polymers and structures.

11. The method of claim 8 wherein said binder material includes:

end-capped polyacetals, including poly(oxymethylene) or polyformaldehyde, poly(trichloroacetaldehyde), poly(n-valeraldehyde), poly(acetaldehyde), and poly(propionaldehyde);

acrylic polymers including polyacrylamide, poly(acrylic acid), poly(methacrylic acid), poly(ethyl acrylate), and poly(methyl methacrylate);

fluorocarbon polymers including poly(tetrafluoroethylene), perfluorinated ethylene-propylene copolymers, ethylene-tetrafluoroethylene copolymers, poly(chlorotrifluoroethylene), ethylene-chlorotrifluoroethylene copolymers, poly(vinylidene fluoride), and poly(vinyl fluoride);

polyamides including poly(6-aminocaproic acid) or poly(e-caprolactam), poly(hexamethylene adipamide), poly(hexamethylene sebacamide), and poly(11-aminoundecanoic acid);

polyaramides including poly(imino-1,3-phenyleneiminoisophthaloyl) or poly(m-phenylene isophthalamide);

parylenes including poly-2-xylylene, and poly(chloro-1-xylylene);

polyaryl ethers including poly(oxy-2,6-dimethyl-1,4-phenylene) or poly(p-phenylene oxide);

polyaryl sulfones including poly(oxy-1,4-phenylenesulfonyl-1,4-phenyleneoxy-1,4-phenyl-eneisopropylide ne-1,4-phenylene), and poly(sulfonyl-1,4-phenylene-oxy-1,4-phenylenesulfonyl4,4'-biphenylene);

polycarbonates including poly-(bisphenol A) or poly(carbonyldioxy-1,4-phenyleneisopropylidene-1,4-phenylene);

polyesters including poly(ethylene terephthalate), poly(tetramethylene terephthalate), and poly(cyclohexyl-ene-1,4-dimethylene terephthalate) or poly(oxymethylene-1,4-cyclohexylenemethyleneoxyterephthaloyl);

polyaryl sulfides including poly(p-phenylene sulfide) or poly(thio-1,4-phenylene);

polyimides including poly(pyromellitimido-1,4-phenylene);

polyolefins including polyethylene, polypropylene, poly(1-butene), poly(2-butene), poly(1-pentene), poly(2-pentene), poly(3-methyl-1-pentene), and poly(4-methyl-1-pentene);

vinyl polymers including poly(vinyl acetate), poly(vinylidene chloride), and poly(vinyl chloride); or

diene polymers including 1,2-poly-1,3-butadiene, 1,4-poly-1,3-butadiene, polyisoprene, and polychloroprene; polystyrenes;

and any combination thereof, and any copolymers thereof.

12. The method of claim 1 wherein said charged material includes:

a colloid;

a small charged molecule; or

a linear or branched polymer having positively charged atoms along the length of the polymer chain having a counter ion associated therewith.

13. The method of claim 12 wherein if said charged material comprises a polymer, the charge density is greater than or equal to about 1 charged atom for approximately every 10 Angstroms, 12 Angstroms, or 20 Angstroms.

14. The method of claim 12 wherein said charged material includes quaternized amines, quaternized amides, quaternary ammonium salts, quaternized imides, benzalkonium compounds, biguanides, cationic aminosilicon compounds, cationic cellulose derivatives, cationic starches, quaternized polyglycol amine condensates, quaternized collagen polypeptides, cationic chitin derivatives, cationic guar gum, colloids including cationic melamine-formaldehyde acid colloids, inorganic treated silica colloids, polyamide-epichlorohydrin resin, cationic acrylamides, polymers, and copolymers and combinations thereof.

15. The method of claim 14 wherein said amines include pyrroles, epichlorohydrin derived amines, and polymers thereof.

16. The method of claim 14 wherein said quaternary ammonium salts include homopolymers of diallyl dimethyl ammonium halide, epichlorohydrin derived polyquaternary amine polymers, quaternary ammonium salts derived from diamines and dihalides, or polyhexamethylenedimethylammonium bromide.

17. The method of claim 12 wherein said charged material includes material chemically bonded, adsorbed, or crosslinked to itself or to a fiber or membrane.

18. The method of claim 12 wherein said charged material includes a solution of sodium bromide and a homopolymer of diallyl dimethyl ammonium chloride or poly-DADMAC (PDADMAC).

19. The method of claim 1 including adding poly acrylic acid (PAA) to form insoluble polyelectrolyte complexes with said charged material.

20. The method of claim 2 including:

for charged material in an aqueous solution, preparing said charged material in an amount approximately 1% to 4% by weight of said core filter media in approximately a 40% aqueous solution; or

for charged material in its pure state, preparing said charged material in an amount approximately 0.2% to 2% by weight of said core filter media.

21. The method of claim 20 including:

dissolving said charged material in an aqueous solution in deionized (DI);

mixing said charged material with said binder material at approximately 15% to 40% by weight of the core filter media, forming said charged binder; and

drying said charged binder.

22. The method of claim 21 including:

mixing said charged binder with amorphous silicon dioxide at approximately 0.05% to 3% by weight of the core filter media; and

straining through a sieve.

23. The method of claim 6 including:

for charged material in aqueous solution, preparing said charged material in approximately a 40% aqueous solution in an amount 2% to 35% by weight of said core filter media; or

for charged material in its pure state, preparing said charged material in an amount approximately 1% to 15% by weight of the core filter media.

24. The method of claim 23 including:

dissolving said charged material in an aqueous solution in deionized water;

mixing said charged material at an amount between 30-70% of the total weight of said binder material with said binder material, said binder material in an amount approximately 2% to 35% by weight of the core filter, forming said charged binder; and

drying said charged binder.

25. The method of claim 1 wherein said step of combining a charged material directly to a binder material includes combining said charged material directly to a binder material and an inert portion of said core filter media.

26. A method of making a filter media having a microbiological interception capability, comprising:

combining a charged material, a microbiological interception enhancing agent, and a binder material to form an enriched binder; and

combining a core filter media with said enriched binder;

and forming said filter media with said core filter media and said enriched binder.

27. The method of claim 26 wherein said microbiological interception enhancing agent comprises a biologically active metal salt solution including biologically active metals.

28. The method of claim 27 wherein said biologically active metals include silver, copper, zinc, cadmium, mercury, antimony, gold, aluminum, platinum, or palladium, and combinations thereof.

29. The method of claim 26 wherein said charged material comprises a cationic charged polymer.

30. The method of claim 29 wherein said charged material includes poly-DADMAC.

31. The method of claim 26 including:

for charged material in an aqueous solution, preparing said charged material in an amount approximately 1% to 4% by weight of said core filter media in approximately a 40% aqueous solution; or

for charged material in its pure state, preparing said charged material in an amount approximately 0.2% to 2% by weight of said core filter media.

32. The method of claim 31 including:

dissolving said charged material in an aqueous solution in deionized (DI) water; and

mixing said charged material with said binder material at approximately 15% to 40% by weight of the core filter media, forming said charged binder.

33. The method of claim 32 including adding silver bromide directly to the charged binder.

34. The method of claim 32 including:

preparing a silver bromide powder (AgBr) from a silver nitrate solution of approximately 1.72% and a sodium bromide (NaBr) solution, such that an amount of silver bromide 0.1% to 1% by weight of said core filter media

is disposed within said core filter media when said core filter media is combined with said enriched binder;

drying said solution and grounding or pulverizing said silver bromide;

combining said silver bromide with said charged binder.

35. The method of claim 26 including:

for a charged material in an aqueous solution, preparing said charged material in an amount approximately 0.05% to 2% by weight of said core filter media in approximately a 40% aqueous solution; or

for charged material in its pure state, preparing said charged material in an amount approximately 0.1% to 1% by weight of said core filter media.

36. The method of claim 35 including:

dissolving said charged material in an aqueous solution in deionized (DI) water; and

mixing said charged material with said binder material at approximately 15% to 40% by weight of the core filter media, forming said charged binder.

37. The method of claim 36 including adding silver bromide directly to the charged binder.

38. The method of claim 36 including:

mixing said solution with wet silver bromide (AgBr);

dissolving in deionized water;

combining with 0.5 to 2 times said solution weight in binder material;

drying said solution; and

combing with said charged binder.

39. The method of claim 38 including:

preparing a silver bromide powder (AgBr) from a silver nitrate solution of approximately 1.72% and a sodium bromide (NaBr) solution, such that an

amount of silver bromide 0.1% to 0.5% AgBr by weight of said core filter media is disposed within said core filter media when said core filter media is combined with said enriched binder;

combining said silver bromide with said charged binder to form said enriched binder; and

heating said enriched binder.

40. The method of claim 26 including:

preparing said charged material in an amount approximately 0.3% to 4% by weight of said core filter media in approximately a 40% aqueous solution;

dissolving said charged material in deionized water;

combining said charged material with wet silver bromide at approximately 0.1% to 0.4% by weight of the core filter media;

adding deionized water;

mixing said combined charged material with approximately 15% to 40% its weight in binder material;

drying the combined charged material and binder material to form said enriched binder;

combining said enriched binder with said core filter media.

41. The method of claim 40 wherein said charged material comprises a cationic charged polymer.

42. A method of making a filter media having a microbiological interception capability, comprising:

combining a binder material with polyacrylic acid (PAA), said PAA in 35% aqueous solution in an amount approximately 0.1% to 10% by weight of said binder material to form a binder-PAA combination;

diluting the binder-PAA combination in deionized water;

drying said binder-PAA combination, and crushing into a powder;

mixing approximately 1% to 5% of said charged material as a percentage of said binder material weight with AgBr at an amount approximately 0.05% to 0.5% by weight of said core filter media;

mixing deionized water with said charged material and said AgBr to form a charged material-AgBr solution;

combining said charged material-AgBr solution with said binder-PAA combination and drying resultant combination to form an enriched binder;

combining a core filter media with said enriched binder;

and forming said filter media with said core filter media and said enriched binder.

43. A method of making a filter media having a microbiological interception capability, comprising:

combining a charged material, a microbiological interception enhancing agent, and a binder material to form an enriched binder, including:

combining said binder material with polyacrylic acid (PAA), said PAA in 35% aqueous solution in an amount approximately 0.1% to 10% by weight of said binder material;

diluting the PAA and binder material combination in deionized water to form a binder-PAA combination;

combining said charged material in an amount approximately 1% to 5% by weight of binder material, and AgBr in an amount approximately 0.05% to 0.5% by weight of said core filter media;

mixing said charged material, said AgBr and said binder-PAA combination with deionized water;

drying said resultant charged material, AgBr, binder-PAA combination;

combining a core filter media with said enriched binder; and

forming said filter media with said core filter media and said enriched binder.

44. A charged binder comprising:

binder material in powder, particulate, or fiber form, in combination with

a charged material including:

a colloid;

a small charged molecule; or

a linear or branched polymer having positively charged atoms along the length of the polymer chain having a counter ion associated therewith.

45. The charged binder of claim 44 wherein said binder material includes: polyolefins, polyvinyl halides, polyvinyl esters, polyvinyl ethers, polyvinyl alcohols, polyvinyl sulfates, polyvinyl phosphates, polyvinyl amines, polyamides, polyimides, polyoxidiazoles, polytriazols, polycarbodiimides, polysulfones, polycarbonates, polyethers, polyarylene oxides, polyesters, polyarylates, phenol-formaldehyde resins, melamine-formaldehyde resins, formaldehyde-ureas, ethyl-vinyl acetate copolymers, co-polymers and block interpolymers thereof, and combinations thereof.

46. The charged binder of claim 44 wherein said charged material includes a polymer having a charge density greater than or equal to about 1 charged atom for approximately every 10 Angstroms, 12 Angstroms, or 20 Angstroms.

47. The charged binder of claim 46 wherein said charged material includes quaternized amines, quaternized amides, quaternary ammonium salts, quaternized imides, benzalkonium compounds, biguanides, cationic aminosilicon compounds, cationic cellulose derivatives, cationic starches, quaternized polyglycol amine condensates, quaternized collagen polypeptides, cationic chitin derivatives, cationic guar gum, colloids including cationic melamine-formaldehyde acid colloids, inorganic treated silica colloids, polyamide-epichlorohydrin resin, cationic acrylamides, polymers, and copolymers and combinations thereof.

48. An intermediate filter media composition having microbiological interception capability, comprising:

a charged binder including a charged material affixed directly to a binder material before being combined with a core filter media and before the application of heat; and

said core filter media combined with said charged binder material.

49. The intermediate filter media composition of claim 48 including having said charged binder enriched by combining at least one microbiological interception enhancing agent to said charged binder before being combined with said core filter media and before the application of heat.

50. A filter having microbiological interception capability, comprising:

a filter media having a core filter media and a charged binder, wherein said charged binder includes binder material with charged material affixed directly thereto before combining with said core filter media, and wherein said filter media has said charged binder dispersed throughout said core filter media after the application of heat;

a housing enclosing said filter media; and

end caps for sealing said filter media within said housing.

51. The filter of claim 50 including having said charged binder enriched by combining at least one microbiological interception enhancing agent to said charged binder before being combined with said core filter media and before the application of heat.

52. The filter of claim 51 including having said filter media formed into a composite block structure, a spiral-wound sheet, or a pleated sheet.

CLAIMS

1. A method of making a filter media having a microbiological interception capability, comprising:

combining a charged material directly to a binder material;

providing poly acrylic acid (PAA) prior to heating;

heating the combined charged material, PAA and the binder material to a temperature range of approximately 150° F. to 160° F. to affix the charged material directly to the binder material, the PAA more securely affixing the charged material to the binder material by forming insoluble polyelectrolyte complexes with said charged material, thereby forming a charged binder material;

combining a core filter media with said charged binder material; and

forming a filter media with said combined core filter media and said charged binder material.

2. The method of claim 1 wherein said step of forming said filter media includes extruding or compression molding said combined core filter media and charged binder into a solid composite or block.

3. The method of claim 2 wherein said core filter media is a material selected from the group consisting of an array of adsorbent or absorbent active particles in powder or particulate form, comprising activated carbon, activated alumina, zeolites, diatomaceous earth, silicates, aluminosilicates, titanates, bone char, calcium hydroxyapatite, manganese oxides, iron oxides, magnesia, perlite, talc, polymeric particulates, clay, iodated resins, ion exchange resins, ceramics, super absorbent polymers (SAPs), and combinations thereof.

4. The method of claim 2 including:

for charged material in an aqueous solution, preparing said charged material in an amount approximately 1% to 4% by weight of said core filter media in approximately a 40% aqueous solution; or

for charged material in its pure state, preparing said charged material in an amount approximately 0.2% to 2% by weight of said core filter media.

5. The method of claim 4 including:

wherein said charged material is in the aqueous solution, said steps include dissolving said charged material in deionized (DI);

mixing said charged material with said binder material at approximately 15% to 40% by weight of the core filter media, forming said charged binder; and

drying said charged binder.

6. The method of claim 5 including:

mixing said charged binder with amorphous silicon dioxide at approximately 0.05% to 3% by weight of the core filter media; and

straining through a sieve.

7. The method of claim 1 wherein said core filter media material comprises fibers including polymers, polyamide, acrylic, acrylonitrile, liquid crystal polymers, ion-exchange resins, engineered resins, cellulose, rayon, lyocell, ramie, wool, silk, glass, metal, ceramic, organic and inorganic fibers or whiskers, or combinations thereof.

8. The method of claim 7 wherein said core filter media includes a combination of fibers with particulate media including: activated carbon, activated alumina, zeolites, diatomaceous earth, silicates, aluminosilicates, titanates, bone char, calcium hydroxyapatite, manganese oxides, iron oxides, magnesia, perlite, talc, polymeric particulates, clay, iodated resins, ion exchange resins, ceramics, super absorbent polymers (SAPs), or combinations thereof.

9. The method of claim 8 wherein said step of forming said filter media includes forming flat sheet media.

10. The method of claim 9 including rolling, layering, or pleating said flat sheet media.

11. The method of claim 9 including:

for charged material in aqueous solution, preparing said charged material in approximately a 40% aqueous solution in an amount 2% to 35% by weight of said core filter media; or

for charged material in its pure state, preparing said charged material in an amount approximately 1% to 15% by weight of the core filter media.

12. The method of claim 11 including:

dissolving said charged material in the aqueous solution comprising deionized water;

mixing said charged material at an amount between 30-70% of the total weight of said binder material with said binder material, said binder material in an amount approximately 2% to 35% by weight of the core filter, forming said charged binder; and

drying said charged binder.

13. The method of claim 1 wherein said binder material is a material selected from the group consisting of powder, particulate, or fiber form, and includes polyolefins, polyvinyl halides, polyvinyl esters, polyvinyl ethers, polyvinyl alcohols, polyvinyl sulfates, polyvinyl phosphates, polyvinyl amines, polyamides, polyimides, polyoxidiazoles, polytriazols, polycarbodiimides, polysulfones, polycarbonates, polyethers, polyarylene oxides, polyesters, polyarylates, phenol-formaldehyde resins, melamine-formaldehyde resins, formaldehyde-ureas, ethyl-vinyl acetate copolymers, co-polymers and block interpolymers thereof, and combinations thereof.

14. The method of claim 13 wherein variations of said binder materials is a material selected from the group consisting of hydroxyl, halogen, lower alkyl groups, lower alkoxy groups, and monocyclic aryl groups.

15. The method of claim 13 wherein said co-polymers are selected from the group consisting of polystyrenes and acrylonitrile-styrene copolymers, styrene-butadiene copolymers, and other non-crystalline or amorphous polymers and structures.

16. The method of claim 13 wherein said binder material is a material selected from the group consisting of:

end-capped polyacetals, including poly(oxymethylene) or polyformaldehyde, poly(trichloroacetaldehyde), poly(n-valeraldehyde), poly(acetaldehyde), and poly(propionaldehyde);

acrylic polymers including polyacrylamide, poly(acrylic acid), poly(methacrylic acid), poly(ethyl acrylate), and poly(methyl methacrylate);

fluorocarbon polymers including poly(tetrafluoroethylene), perfluorinated ethylene-propylene copolymers, ethylene-tetrafluoroethylene copolymers, poly(chlorotrifluoroethylene), ethylene-chlorotrifluoroethylene copolymers, poly(vinylidene fluoride), and poly(vinyl fluoride);

polyamides including poly(6-aminocaproic acid) or poly(e-caprolactam), poly(hexamethylene adipamide), poly(hexamethylene sebacamide), and poly(11-aminoundecanoic acid);

polyaramides including poly(imino-1,3-phenyleneiminoisophthaloyl) or poly(m-phenylene isophthalamide);

parylenes including poly-2-xylylene, and poly(chloro-1-xylylene);

polyaryl ethers including poly(oxy-2,6-dimethyl-1,4-phenylene) or poly(p-phenylene oxide);

polyaryl sulfones including poly(oxy-1,4-phenylenesulfonyl-1,4-phenyleneoxy-1,4-phenyleneisopropylide- ne-1,4-phenylene), and poly(sulfonyl-1,4-phenylene-oxy-1,4-phenylenesulfonyl-4,4'-biphenylene);

polycarbonates including poly-(bisphenol A) or poly(carbonyldioxy-1,4-phenyleneisopropylidene-1,4-phenylene);

polyesters including poly(ethylene terephthalate), poly(tetramethylene terephthalate), and poly(cyclohexyl-ene-1,4-dimethylene terephthalate) or poly(oxymethylene-1,4-cyclohexylenemethyleneoxyterephthaloyl);

polyaryl sulfides including poly(p-phenylene sulfide) or poly(thio-1,4-phenylene);

polyimides including poly(pyromellitimido-1,4-phenylene);

polyolefins including polyethylene, polypropylene, poly(1-butene), poly(2-butene), poly(1-pentene), poly(2-pentene), poly(3-methyl-1-pentene), and poly(4-methyl-1-pentene);

vinyl polymers including poly(vinyl acetate), poly(vinylidene chloride), and poly(vinyl chloride);

diene polymers including 1,2-poly-1,3-butadiene, 1,4-poly-1,3-butadiene, polyisoprene, and polychloroprene;

polystyrenes; and

any combination thereof, and any copolymers thereof.

17. The method of claim 1 wherein said charged material is a material selected from the group consisting of:

a colloid;

a small charged molecule; and

a linear or branched polymer having positively charged atoms along the length of the polymer chain having a counter ion associated therewith.

18. The method of claim 17 wherein if said charged material comprises a polymer, the charge density is greater than or equal to about 1 charged atom for approximately every 10 Angstroms, 12 Angstroms, or 20 Angstroms.

19. The method of claim 17 wherein said charged material is a material selected from the group consisting of quaternized amines, quaternized amides, quaternary ammonium salts, quaternized imides, benzalkonium compounds, biguanides, cationic aminosilicon compounds, cationic cellulose derivatives, cationic starches, quaternized polyglycol amine condensates, quaternized collagen

polypeptides, cationic chitin derivatives, cationic guar gum, colloids including cationic melamine-formaldehyde acid colloids, inorganic treated silica colloids, polyamide-epichlorohydrin resin, cationic acrylamides, polymers, and copolymers and combinations thereof.

20. The method of claim 19 wherein said quaternized amines are selected from the group consisting of pyrroles, epichlorohydrin derived amines, and polymers thereof.

21. The method of claim 19 wherein said quaternary ammonium salts include homopolymers of diallyl dimethyl ammonium halide, epichlorohydrin derived polyquaternary amine polymers, quaternary ammonium salts derived from diamines and dihalides, or polyhexamethylenedimethylammonium bromide.

22. The method of claim 17 wherein said charged material includes material chemically bonded, adsorbed, or crosslinked to itself or to a fiber or membrane.

23. The method of claim 17 wherein said charged material includes a solution of sodium bromide and a homopolymer of diallyl dimethyl ammonium chloride or poly-DADMAC (PDADMAC).

24. The method of claim 1 wherein said step of combining a charged material directly to a binder material includes combining said charged material directly to a binder material and an inert portion of said core filter media.

25. The method of claim 1 wherein the charged material comprises a cationic material, the cationic material to binder material ratio being below 0.5.

26. The method of claim 1 further including the step of adding a microbiological interception enhancing agent before or after the step of heating.

27. The method of claim 1 wherein during heating the binder material melts to affix the charged material thereto by attachment to the outside of the binder material while the PAA forms the insoluble polyelectrolyte complexes with the charged material to enhance the attachment of the charged material to the binder material.

28. The method of claim 1 wherein during heating the binder material melts to affix the charged material thereto by attachment to the inside of the binder material while the PAA forms the insoluble

polyelectrolyte complexes with the charged material to enhance the attachment of the charged material to the binder material.

29. The method of claim 1 wherein during heating the binder material melts to affix the charged material thereto by being embedded within the binder material while the PAA forms the insoluble polyelectrolyte complexes with the charged material to increase the affixing of the embedded charged materials within the binder material.

30. The method of claim 1 wherein during heating the binder material melts to affix the charged material thereto by being anchored to the binder material while the PAA forms the insoluble polyelectrolyte complexes with the charged material to increase the anchoring of the charged materials to the binder material.

31. A method of making a filter media having a microbiological interception capability, comprising:

providing a combination of a charged material, poly acrylic acid (PAA), and a binder material;

heating the combination to a temperature range of approximately 150° F. to 160° F. to attach the charged material directly to the binder material whereby the PAA forms insoluble polyelectrolyte complexes with the charged material to enhance the attachment of the charged material to the binder material, thereby forming a charged binder material;

treating the charged binder material with a microbiological interception enhancing agent to form an enriched binder;

combining a core filter media with said enriched binder; and

forming said filter media with said core filter media and said enriched binder.

32. The method of claim 31 wherein said microbiological interception enhancing agent comprises a biologically active metal salt solution including biologically active metals.

33. The method of claim 32 wherein said biologically active metals include silver, copper, zinc, cadmium, mercury, antimony, gold, aluminum, platinum, or palladium, and combinations thereof.

34. The method of claim 31 wherein said charged material comprises a cationic charged polymer.

35. The method of claim 34 wherein said charged material includes poly-DADMAC.

36. The method of claim 31 including:

for charged material in an aqueous solution, preparing said charged material in an amount approximately 1% to 4% by weight of said core filter media in approximately a 40% aqueous solution; or

for charged material in its pure state, preparing said charged material in an amount approximately 0.2% to 2% by weight of said core filter media.

37. The method of claim 36 including:

wherein said charged material is in the aqueous solution, said steps include dissolving said charged material in deionized (DI); and

mixing said charged material with said binder material at approximately 15% to 40% by weight of the core filter media, forming said charged binder.

38. The method of claim 37 wherein the microbiological interception enhancing agent comprises silver bromide added directly to the charged binder.

39. The method of claim 31 including:

for a charged material in an aqueous solution, preparing said charged material in an amount approximately 0.05% to 2% by weight of said core filter media in approximately a 40% aqueous solution; or

for charged material in its pure state, preparing said charged material in an amount approximately 0.1% to 1% by weight of said core filter media.

40. The method of claim 39 including:

wherein said charged material is in the aqueous solution, said steps include dissolving said charged material in deionized (DI); and

mixing said charged material with said binder material at approximately 15% to 40% by weight of the core filter media, forming said charged binder.

41. The method of claim 40 wherein the microbiological interception enhancing agent comprises silver bromide added directly to the charged binder.

42. The method of claim 31 wherein during heating the binder material melts to affix the charged material thereto by attachment to the outside of the binder material while the PAA forms the insoluble

polyelectrolyte complexes with the charged material to enhance the attachment of the charged material to the binder material.

43. The method of claim 31 wherein during heating the binder material melts to affix the charged material thereto by attachment to at least a portion of the inside of the binder material while the PAA forms the insoluble polyelectrolyte complexes with the charged material to enhance the attachment of the charged material to the binder material.

44. A method of making a filter media having a microbiological interception capability, comprising:

providing a combination of a charred material, poly acrylic acid (PAA), and a binder material;

heating the combination to attach the charged material directly to the binder material whereby the PAA forms insoluble polyelectrolyte complexes with the charged material to enhance the attachment of the charged material to the binder material, thereby forming a charged binder material;

preparing a silver bromide powder (AgBr) from a silver nitrate solution of approximately 1.72% and a sodium bromide (NaBr) solution, and

drying said solution and grounding or pulverizing said silver bromide;

treating the charged binder material with a microbiological interception enhancing agent comprising said silver bromide to form an enriched binder;

combining a core filter media with said enriched binder, such that an amount of silver bromide 0.1% to 1% by weight of said core filter media is disposed within said core filter media; and

forming said filter media with said core filter media and said enriched binder,

wherein,

for charged material in an aqueous solution, preparing said charged material in an amount approximately 0.05% to 4% by weight of said core filter media in approximately a 40% aqueous solution; or

for charged material in its pure state, preparing said charged material in an amount approximately 0.1% to 2% by weight of said core filter media,

and wherein when,

said charged material is in the aqueous solution, said steps include dissolving said charged material in deionized (DI); and

mixing said charged material with said binder material at approximately 15% to 40% by weight of the core filter media forming said charged binder.

45. A method of making a filer media having a microbiological interception capability, comprising:

providing a combination of a charged material, poly acrylic acid (PAA), and a binder material;

heating the combination to attach the charged material directly to the binder material whereby the PAA forms insoluble polyelectrolyte complexes with the charged material to enhance the attachment of the charged material to the binder material, thereby forming a charged binder material;

treating the charged binder material with a microbiological interception enhancing agent of wet silver bromide (AgBr) to form an enriched binder, whereby the AgBr is dissolved in deionized water, combining with 0.5 to 2 times said solution weight in binder material, dried and then combined with said charged binder material;

combining a core filter media with said enriched binder; and

forming said filter media with said core filter media and said enriched binder,

wherein,

for charged material in an aqueous solution, preparing said charged material in an amount approximately 0.05% to 4% by weight of said core filter media in approximately a 40% aqueous solution; or

for charged material in its pure state, preparing said charged material in an amount approximately 0.1% to 2% by weight of said core filter media,

and wherein when,

aid charged material is in the aqueous solution, said steps include dissolving said charged material in deionized (DI); and

mixing said charged material with said binder material at approximately 15% to 40% by weight of the core filter media, forming said charged binder.

46. The method of claim 45 including:

preparing a silver bromide powder (AgBr) from a silver nitrate solution of approximately 1.72% and a sodium bromide (NaBr) solution, such that an amount of silver bromide 0.1% to 0.5% AgBr by weight of said core filter media is disposed within said core filter media when said core filter media is combined with said enriched binder;

combining said silver bromide with said charged binder to form said enriched binder; and

heating said enriched binder.

47. A method of making a filter media having a microbiological interception capability, comprising:

providing a combination of a charged material, poly acrylic acid (PAA), and a binder material;

heating the combination to attach the charged material directly to the binder material whereby the PAA forms insoluble polyelectrolyte complexes with the charged material to enhance the attachment of the charged material to the binder material, thereby forming a charged binder material;

treating the charged binder material with a microbiological interception enhancing agent to form an enriched binder;

whereby said enriched binder is formed by,

preparing said charged material in an amount approximately 0.3% to 4% by weight of a core filter media in approximately a 40% aqueous solution;

combining said charged material with wet silver bromide at approximately 0.1% to 0.4% by weight of the core filter media;

adding deionized water;

mixing said combined charged material with approximately 15% to 40% its weight in binder material;

drying the combined charged material and binder material to form said enriched binder;

combining said enriched binder with said core filter media; and

forming said filter media with said core filter media and said enriched binder.

48. The method of claim 47 wherein said charged material comprises a cationic charged polymer.

49. A method of making a filter media having a microbiological interception capability, comprising:

combining a binder material with polyacrylic acid (PAA), said PAA in 35% aqueous solution in an amount approximately 0.1% to 10% by weight of said binder material to form a binder-PAA combination;

diluting the binder-PAA combination in deionized water;

drying said binder-PAA combination, and crushing into a powder;

mixing approximately 1% to 5% of said charged material as a percentage of said binder material weight with AgBr at an amount approximately 0.05% to 0.5% by weight of said core filter media;

mixing deionized water with said charged material and said AgBr to form a charged material-AgBr solution;

combining said charged material-AgBr solution with said binder-PAA combination and drying resultant combination to form an enriched binder;

combining a core filter media with said enriched binder; and

forming said filter media with said core filter media and said enriched binder.

50. A method of making a filter media having a microbiological interception capability, comprising:

combining a charged material, a microbiological interception enhancing agent, and a binder material to form an enriched binder, including:

combining said binder material with polyacrylic acid (PAA), said PAA in 35% aqueous solution in an amount approximately 0.1% to 10% by weight of said binder material;

diluting the PAA and binder material combination in deionized water to form a binder-PAA combination;

combining said charged material in an amount approximately 1% to 5% by weight of binder material, and AgBr in an amount approximately 0.05% to 0.5% by weight of said core filter media;

mixing said charged material, said AgBr and said binder-PAA combination with deionized water;

drying said resultant charged material, AgBr, binder-PAA combination;

combining a core filter media with said enriched binder; and

forming said filter media with said core filter media and said enriched binder.