CLAIMS

1. A method comprising:

continuously introducing a matrix material into a mold cavity, the matrix material comprising a plurality of active particles and a plurality of binder particles;

heating at least a portion of the matrix material so as to bind the matrix material at a plurality of contact points thereby forming a porous mass length, wherein heating involves irradiating with microwave radiation the at least a portion of the matrix material; and

cutting the porous mass length radially thereby yielding a porous mass.

2. The method of claim 1, wherein the matrix material has a moisture content of about 5% by weight or less.

3. The method of claim 1, wherein the porous mass is produced at a linear speed of about 800 m/min or less.

4. The method of claim 1, wherein irradiating with microwave radiation occurs in a residence time of about 10 seconds or less.

5. The method of claim 1, wherein continuously combining involves pneumatic dense phase feeding of the matrix material into the paper wrapper.

6. The method of claim 1, wherein heating is to a temperature at or above a softening temperature of the at least a portion of the matrix material in the mold cavity.

7. The method of claim 1, wherein the binder particle comprises at least one selected from the group consisting of ultrahigh molecular weight polyethylene, very high molecular weight polyethylene, high molecular weight polyethylene, a polyolefin, a polyester, a polyamide, a nylon, a polyacrylic, a polystyrene, a polyvinyl, polytetrafluoroethylene, polyether ether ketone, a non-fibrous plasticized cellulose, polyethylene, polypropylene, polybutylene, polymethylpentene, low-density polyethylene, linear low-density polyethylene, high-density polyethylene, polyethylene terephthalate, polybutylene terephthalate, polycyclohexylene dimethylene terephthalate, polytrimethylene terephthalate, polyacrylics, polymethyl methacrylate, polystyrene, acrylonitrile-butadiene-styrene, styrene-acrylonitrile, styrene-butadiene, styrene-maleic anhydride, ethylene vinyl acetate, ethylene vinyl alcohol, polyvinyl chloride, cellulose acetate, cellulose acetate butyrate, plasticized

cellulosics, cellulose propionate, ethyl cellulose, any derivative thereof, any copolymer thereof, and any combination thereof.

8. The method of claim 1, wherein the active particle comprises at least one selected from the group consisting of: activated carbon, an ion exchange resin, a desiccant, a silicate, a molecular sieve, a silica gel, activated alumina, a zeolite, perlite, sepiolite, Fuller's Earth, magnesium silicate, a metal oxide, iron oxide, and any combination thereof.

9. The method of claim 1, wherein the active particle comprises at least one selected from the group consisting of: a nano-scaled carbon particle, a carbon nanotube having at least one wall, a carbon nanohorn, a bamboo-like carbon nanostructure, a fullerene, a fullerene aggregate, graphene, a few layer graphene, oxidized graphene, an iron oxide nanoparticle, a nanoparticle, a metal nanoparticle, a gold nanoparticle, a silver nanoparticle, a metal oxide nanoparticle, an alumina nanoparticle, a magnetic nanoparticle, a paramagnetic nanoparticle, a superparamagnetic nanoparticle, a gadolinium oxide nanoparticle, a hematite nanoparticle, a magnetite nanoparticle, a gado-nanotube, an endofullerene, Gd@C60, a core-shell nanoparticle, an onionated nanoparticle, a nanoshell, an onionated iron oxide nanoparticle, and any combination thereof.

10. The method of claim 1, wherein the matrix material comprises a ratio of the active particles to the binder particles of about 1 wt% active particles and about 99 wt% binder particles to about 99 wt% active particles and about 1 wt% binder particles.

11. The method of claim 1, wherein the porous mass has a void volume of about 40% to about 90%.

12. The method of claim 1, wherein the porous mass has an active particle loading of at least about 1 mg/mm and an encapsulated pressure drop less than about 20 mm of water per mm length of porous mass.

13. The method of claim 1, wherein the porous mass has a carbon loading of at least about 6 mg/mm and an encapsulated pressure drop of about 20 mm of water or less per mm of length.

14. The method of claim 1, wherein the active particle comprises activated carbon and the binder particle comprises polyethylene, and wherein the matrix

material comprises the active particle and the binder particle in a ratio of about 50:50 to about 90:10 by weight.

15. A method comprising:

continuously combining a matrix material and a paper wrapper to form a desired cross-sectional shape where the matrix material is confined by the paper wrapper, the matrix material comprising a binder particle and an active particle;

heating at least a portion of the matrix material so as to bind the matrix material at a plurality of contact points thereby forming a porous mass length, wherein heating involves irradiating with microwave radiation the at least a portion of the matrix material;

cooling the porous mass length; and

cutting the porous mass length radially thereby producing a porous mass.

16. The method of claim 15, wherein the paper wrapper is removable from the porous mass.

17. The method of claim 15, wherein the porous mass is produced at a linear speed of about 800 m/min or less.

18. The method of claim 15, wherein irradiating with microwave radiation occurs in a residence time of about 10 seconds or less.

19. The method of claim 15, wherein continuously combining involves pneumatic dense phase feeding of the matrix material into the paper wrapper.

20. The method of claim 15, wherein heating is to a temperature at or above a softening temperature of the at least a portion of the matrix material.

21. The method of claim 15, wherein the active particle comprises activated carbon and the binder particle comprises polyethylene, and wherein the matrix material comprises the active particle and the binder particle in a ratio of about 50:50 to about 90:10 by weight.

22. A method comprising:

continuously combining a matrix material and a paper wrapper to form a desired cross-sectional shape where the matrix material is confined by the paper wrapper, the matrix material comprising a binder particle and an active particle, the active particle comprising a carbon particle;

heating at least a portion of the matrix material so as to bind the matrix material at a plurality of contact points, thereby forming a porous mass length, wherein heating involves irradiating with microwave radiation the at least a portion of the matrix material, and wherein irradiating with microwave radiation occurs in a residence time of about 10 seconds or less; and

wherein the porous mass length is produced at a linear speed of about 800 m/min or less.

CLAIMS

1. A method comprising:

continuously introducing a matrix material into a mold cavity, the matrix material comprising a plurality of active particles and a plurality of binder particles;

heating at least a portion of the matrix material while in the mold cavity so as to bind the matrix material at a plurality of contact points thereby forming a porous mass length, wherein heating involves irradiating with microwave radiation the at least a portion of the matrix material; and

cutting the porous mass length radially thereby yielding a porous mass.

2. The method of claim 1, wherein the matrix material has a moisture content of about 5% by weight or less.

3. The method of claim 1, wherein the porous mass is produced at a linear speed of about 800 m/min or less.

4. The method of claim 1, wherein irradiating with microwave radiation occurs in a residence time of about 10 seconds or less.

5. The method of claim 1, wherein continuously combining involves pneumatic dense phase feeding of the matrix material into the paper wrapper.

6. The method of claim 1, wherein heating is to a temperature at or above a softening temperature of the at least a portion of the matrix material in the mold cavity.

7. The method of claim 1, wherein the binder particle comprises at least one selected from the group consisting of ultrahigh molecular weight polyethylene, very high molecular weight polyethylene, high molecular weight polyethylene, a

polyolefin, a polyester, a polyamide, a nylon, a polyacrylic, a polystyrene, a polyvinyl, polytetrafluoroethylene, polyether ether ketone, a non-fibrous plasticized cellulose, polyethylene, polypropylene, polybutylene, polymethylpentene, low-density polyethylene, linear low-density polyethylene, high-density polyethylene, polyethylene terephthalate, polybutylene terephthalate, polycyclohexylene dimethylene terephthalate, polytrimethylene terephthalate, polyacrylics, polymethyl methacrylate, polystyrene, acrylonitrile-butadiene-styrene, styrene-acrylonitrile, styrene-butadiene, styrene-maleic anhydride, ethylene vinyl acetate, ethylene vinyl alcohol, polyvinyl chloride, cellulose acetate, cellulose acetate butyrate, plasticized cellulosics, cellulose propionate, ethyl cellulose, any derivative thereof, any copolymer thereof, and any combination thereof.

8. The method of claim 1, wherein the active particle comprises at least one selected from the group consisting of: activated carbon, an ion exchange resin, a desiccant, a silicate, a molecular sieve, a silica gel, activated alumina, a zeolite, perlite, sepiolite, Fuller's Earth, magnesium silicate, a metal oxide, iron oxide, and any combination thereof.

9. The method of claim 1, wherein the active particle comprises at least one selected from the group consisting of: a nano-scaled carbon particle, a carbon nanotube having at least one wall, a carbon nanohorn, a bamboo-like carbon nanostructure, a fullerene, a fullerene aggregate, graphene, a few layer graphene, oxidized graphene, an iron oxide nanoparticle, a nanoparticle, a metal nanoparticle, a gold nanoparticle, a silver nanoparticle, a metal oxide nanoparticle, an alumina nanoparticle, a magnetic nanoparticle, a paramagnetic nanoparticle, a superparamagnetic nanoparticle, a gadolinium oxide nanoparticle, a hematite nanoparticle, a magnetite nanoparticle, a gado-nanotube, an endofullerene, Gd@C60, a core-shell nanoparticle, an onionated nanoparticle, a nanoshell, an onionated iron oxide nanoparticle, and any combination thereof.

10. The method of claim 1, wherein the matrix material comprises a ratio of the active particles to the binder particles of about 1 wt% active particles and

about 99 wt% binder particles to about 99 wt% active particles and about 1 wt% binder particles.

11. The method of claim 1, wherein the porous mass has a void volume of about 40% to about 90%.

12. The method of claim 1, wherein the porous mass has an active particle loading of at least about 1 mg/mm and an encapsulated pressure drop less than about 20 mm of water per mm length of porous mass.

13. The method of claim 1, wherein the porous mass has a carbon loading of at least about 6 mg/mm and an encapsulated pressure drop of about 20 mm of water or less per mm of length.

14. The method of claim 1, wherein the active particle comprises activated carbon and the binder particle comprises polyethylene, and wherein the matrix material comprises the active particle and the binder particle in a ratio of about 50:50 to about 90:10 by weight.