Claims:

1. A method of forming a filter membrane by additive manufacturing steps, the method comprising:

forming a first layer on a surface;

forming a second layer over the first layer, the first and second layers comprising a feedstock, the feedstock containing metal particles, wherein the metal particles, measured in powder form, have a relative apparent density in a range from 5 to 25 percent of a theoretical density of the particles, wherein the theoretical density of the particles is a mass per volume of a single particle; and

sintering the metal particles to form a porous sintered metal body, where the porous sintered metal body is a filter membrane containing from 20 to 50 percent metal particles by volume,

wherein forming each of the first and second layers further comprises:

selectively solidifying the feedstock at portions of each layer to form solidified feedstock, the portions in each layer containing from 20 to 50 percent of the metal particles by volume, and

wherein sintering the metal particles further comprises:

sintering the metal particles of the portions of each of the first and second layers to form the porous sintered metal body.

2. The method of claim 1, wherein forming each of the first and second layers further comprises:

separating the solidified feedstock from feedstock that remains after forming the solidified feedstock.

3. The method of claim 1, wherein the metal particles, measured in powder form, have an apparent density below 2.0 grams per cubic centimeter.

4. The method of claim 1, wherein the feedstock comprises the metal particles and pore forming polymer particles.

5. The method of claim 4, wherein selectively solidifying the feedstock further comprises selectively applying liquid polymeric binder to the portions of each layer and

allowing the liquid polymeric binder to solidify into a solid polymer at the portions of each layer.

6. The method of claim 4, wherein selectively solidifying the feedstock further comprises selectively applying electromagnetic energy onto the portions of each layer to cause the pore-forming polymer particles to melt.

7. The method of claim 1, wherein the feedstock further comprises a curable liquid polymer.

8. The method of claim 7, wherein selectively solidifying the feedstock further comprises selectively applying electromagnetic energy to the portions of each layer to cause the curable liquid polymer to cure into a solid polymer at the portions of each layer.

9. The method of claim 1, wherein the feedstock comprises at least 95 weight percent metal particles.

10. The method of claim 9, wherein selectively solidifying the feedstock further comprises selectively applying liquid polymeric binder onto the portions of each layer and allowing or causing the liquid polymeric binder to solidify into a solid polymer at the portions of each layer.

11. The method of claim 1, further comprising:

forming one or more additional layers over the second layer, each additional layer comprising the feedstock;

wherein forming the one or more additional layers further comprises:

selectively solidifying feedstock at portions of each additional layer to form solidified feedstock, the portions containing from 20 to 50 percent metal particles by volume, and

separating the solidified feedstock from feedstock that remains after forming the solidified feedstock in each additional layer.

12. The method of claim 1, wherein the filter membrane is an annular filter membrane having a shape comprising a three-dimensional tube.

13. The method of claim 1, wherein the filter membrane is a three-dimensional non-tubular filter membrane.

14. A feedstock composition comprising:

from 50 to 80 percent by volume curable liquid polymeric binder, and

from 20 to 50 percent by volume metal particles based on total volume of the feedstock composition, wherein the metal particles, measured in powdered form, have a relative apparent density in a range from 5 to 25 percent of a theoretical density of the particles, wherein the theoretical density of the particles is a mass per volume of a single particle.

15. A feedstock composition comprising:

solid pore-forming polymer particles, and

from 20 to 50 percent by volume metal particles based on total volume of the feedstock composition, wherein the metal particles, measured in powdered form, have a relative apparent density in a range from 5 to 25 percent of a theoretical density of the particles, wherein the theoretical density of the particles is a mass per volume of a single particle.

16. A filter membrane formed by the additive manufacturing method of claim 1 and comprising sintered metal particles and having a porosity in a range from 50 to 80 percent.

17. The filter membrane of claim 16, wherein the sintered metal particles are dendritic particles.

18. The filter membrane of claim 16, wherein the sintered metal particles are fibrous particles.

19. The filter membrane of claim 16 having a multi-layer structure that is visible using an optical microscope.