

CLAIMS

1. A method of electroless deposition of a metal on a three-dimensional polymeric structure, the method comprising:
 - 5 providing a solid composition comprising a polymer and metal ions homogeneously distributed therein;
 - fabricating the three-dimensional polymeric structure having one or more regions formed of the solid composition; and
 - forming the metal on the one or more regions.
- 10 2. The method of claim 1, wherein providing the solid composition comprises generating the solid composition from a composition comprising one or more organic solvents having the polymer and a metal catalyst precursor homogeneously dissolved therein, wherein the one or more organic solvents comprise acetone.
- 15 3. The method of claim 2, wherein generating the solid composition comprises:
 - dissolving the polymer in the acetone to generate a polymer solute; and
 - dissolving the metal catalyst precursor in the acetone to form the metal ions.
- 20 4. The method of claim 3, wherein generating the solid composition comprises mixing the polymer solute and the metal ions in the acetone to form the composition.
5. The method of any one of claims 2 to 4, wherein the metal catalyst precursor comprises palladium chloride.
- 25 6. The method of any one of claims 1 to 5, wherein the polymer comprises acrylonitrile butadiene styrene or polylactic acid.
7. The method of any one of claims 1 to 6, wherein the metal ions comprise
30 palladium ions.

8. The method of any one of claims 2 to 7, wherein generating the solid composition comprises:

filling the composition into a mold;

removing the one or more organic solvents to form the solid composition

5 configured with a shape based on the mold; and

separating the solid composition from the mold.

9. The method of any one of claims 1 to 8, wherein fabricating the three-dimensional polymeric structure comprises 3D printing of the three-dimensional
10 polymeric structure entirely from the solid composition, wherein the one or more regions are defined as entire surface area of the three-dimensional polymeric structure.

10. The method of any one of claims 1 to 8, wherein fabricating the three-dimensional polymeric structure comprises depositing the solid composition on one or
15 more surface areas of a pre-formed three-dimensional polymeric structure, wherein the one or more regions are defined by the solid composition deposited on the one or more surface areas.

20 11. The method of any one of claims 1 to 10, wherein forming the metal on the one or more regions comprises contacting the one or more regions with an alkaline bath comprising a reducing agent.

12. The method of claim 11, wherein the reducing agent comprises sodium
25 hypophosphite.

13. The method of any one of claims 1 to 12, wherein the metal comprises nickel.

14. A method of electroless deposition of a metal on a three-dimensional polymeric structure, the method comprising:
- providing a composition comprising one or more organic solvents having a polymer and a metal catalyst precursor homogeneously dissolved therein;
- 5 fabricating the three-dimensional polymeric structure from the composition; and
- forming the metal on the three-dimensional polymeric structure, wherein the one or more organic solvents comprise acetone.
- 10 15. The method of claim 14, wherein providing the composition comprises: dissolving the polymer in the acetone to generate a polymer solute; and dissolving the metal catalyst precursor in the acetone to form metal ions.
16. The method of claim 15, wherein providing the composition comprises mixing
- 15 the polymer solute and the metal ions in the acetone to form the composition.
17. The method of claim 15 or 16, wherein the metal ions comprise palladium ions.
- 20 18. The method of any one of claims 14 to 17, wherein the polymer comprises acrylonitrile butadiene styrene or polylactic acid.
19. The method of any one of claims 14 to 18, wherein the metal catalyst precursor comprises palladium chloride.
- 25 20. The method of any one of claims 14 to 19, wherein fabricating the three-dimensional polymeric structure comprises electrospinning the composition to form the three-dimensional polymeric structure, wherein the three-dimensional polymeric structure comprises polymeric fibers having metal ions homogeneously distributed
- 30 therein.

21. The method of any one of claims 14 to 20, wherein fabricating the three-dimensional polymeric structure comprises ejecting the composition by air pressure onto a substrate.
- 5 22. The method of any one of claims 14 to 21, wherein forming the metal on the three-dimensional polymeric structure comprises forming the metal on a surface area of the three-dimensional polymeric structure.
23. The method of any one of claims 14 to 22, wherein forming the metal on the
10 three-dimensional polymeric structure comprises contacting the three-dimensional polymeric structure with an alkaline bath comprising a reducing agent.
24. The method of claim 23, wherein the reducing agent comprises sodium hypophosphite.
- 15 25. The method of any one of claims 14 to 24, wherein the metal comprises nickel.
26. A method of forming a composition for electroless deposition of a metal on a
20 three-dimensional polymeric structure, the method comprising:
mixing a polymer and a metal catalyst precursor in one or more organic solvents to form the composition, wherein the one or more organic solvents comprise acetone.
- 25 27. The method of claim 26, wherein mixing the polymer and the metal catalyst precursor comprises:
dissolving the polymer in the acetone to generate a polymer solute; and
dissolving the metal catalyst precursor in the acetone to form metal ions.
- 30 28. The method of claim 27, wherein the metal ions comprise palladium ions.

29. The method of any one of claims 26 to 28, wherein the polymer comprises acrylonitrile butadiene styrene or polylactic acid.

30. The method of any one of claims 26 to 29, wherein the metal catalyst precursor comprises palladium chloride.

31. A composition for electroless deposition of a metal on a three-dimensional polymeric structure, the composition comprising:

a polymer;

a metal catalyst precursor; and

one or more organic solvents comprising the polymer and the metal catalyst precursor homogeneously dissolved therein, wherein the one or more organic solvents comprise acetone.

32. The composition of claim 31, wherein the polymer comprises acrylonitrile butadiene styrene or polylactic acid.

33. The composition of claim 31 or 32, wherein the metal catalyst precursor comprises palladium chloride.

34. The composition of any one of claims 31 to 33, wherein the composition is formable into a solid composition for 3D printing.

35. A solid composition for electroless deposition of a metal on a three-dimensional polymeric structure, wherein the solid composition is generated from a composition comprising:

a polymer;

a metal catalyst precursor; and

one or more organic solvents comprising the polymer and the metal catalyst precursor homogeneously dissolved therein, wherein the one or more organic solvents comprise acetone,

wherein the solid composition comprises:

the polymer; and
metal ions homogeneously distributed therein.

36. The solid composition of claim 35, wherein the polymer comprises
5 acrylonitrile butadiene styrene or polylactic acid.

37. The solid composition of claim 35 or 36, wherein the metal catalyst precursor
comprises palladium chloride.

10 38. The composition of any one of claims 35 to 37, wherein the metal ions
comprise palladium ions.

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