CLAIMS:

1. A composition comprising at least one metal complex comprising at least one metal and at least two ligands, wherein at least one first ligand is a sigma donor to the metal and volatilizes upon heating the metal complex, and at least one second ligand different from the first which also volatilizes upon heating the metal complex, wherein the metal complex is soluble in a solvent at 25°C, wherein the second ligand is a carboxylate comprising an alkyl group, and the first ligand is a polydentate amine, and the metal is silver, gold, or copper.

2. The composition of claim 1, wherein the metal is silver.

3. The composition of claim 1, wherein the metal complex comprises only one metal center.

4. The composition of claim 1, wherein the first ligand is a bidentate ligand.

5. The composition of claim 1, wherein the first ligand is a tridentate ligand.

6. The composition of claim 1, wherein the first ligand is not a phosphine.

7. The composition of claim 1, wherein the second ligand is a carboxylate represented by OOC-R, wherein R is an alkyl group, wherein R has 5 or fewer carbon atoms.

8. The composition of claim 1, wherein the composition is totally free of nanoparticles.

9. The composition of claim 1, wherein the composition has a sharp decomposition transition beginning at a temperature of less than 200°C.

10. The composition of claim 1, wherein the composition can be stored at about 25°C for at least 100 hours without substantial deposition of metal (0).

11. The composition of claim 1, wherein the composition further comprises at least one solvent for the complex.

12. The composition of claim 1, wherein the solvent is an aromatic hydrocarbon solvent.

13. The composition of claim 1, wherein the metal complex comprises at least 50 wt.% metal.

14. The composition of claim 1, wherein the metal complex comprises at least 70 wt.% metal.

15. The composition of claim 1, wherein the second ligand is a carboxylate, the first ligand is a polydentate amine, the metal is silver or gold, and wherein the solvent is toluene or a xylene.

16. The composition of claim 1, wherein the first ligand has six or fewer carbon atoms.

17. The composition of claim 1, wherein the number of carbon atoms in the complex is twelve or less.

18. A method comprising:

depositing an ink on a surface, wherein the ink comprises a composition according to claims 1-17 and

producing a conductive metal film by heating or irradiating said ink.

19. The method of claim 18, wherein the producing step is carried out by heating.

20. The method of claim 18, wherein the producing step is carried out by irradiating.

21. The method of claim 18, wherein the producing is carried out by heating at a temperature of about 200°C or less.

22. The method of claim 18, wherein the producing is carried out by heating at a temperature of about 150°C or less.

23. The method of claim 18, wherein the film is in the form of a line, and the line has a conductivity of at least 5,000 S/cm.

24. The method of claim 18, wherein the film is in the form of a line, and the line has a work function which is within 25 percent of the work function of the pure metal.

25. The method of claim 18, wherein the film is in the form of a line, and the line has a work function which is within 10 percent of the work function of the pure metal.

CLAIMS:

1. A composition comprising at least one metal complex comprising at least one metal and at least two ligands, wherein at least one first ligand is a sigma donor to the metal and volatilizes upon heating the metal complex, and at least one second ligand different from the first which also volatilizes upon heating the metal complex, wherein the metal complex is soluble in a solvent at 25°C, wherein the second ligand is a carboxylate comprising an alkyl group, and the first ligand is a polydentate amine, and the metal is silver, gold, or copper.

2. The composition of claim 1, wherein the metal is silver.

3. The composition of claim 1, wherein the metal complex comprises only one metal center.

4. The composition of claim 1, wherein the first ligand is a bidentate ligand.

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6. The composition of claim 1, wherein the first ligand is not a phosphine.

7. The composition of claim 1, wherein the second ligand is a carboxylate represented by OOC-R, wherein R is an alkyl group, wherein R has 5 or fewer carbon atoms.

8. The composition of claim 1, wherein the composition is totally free of nanoparticles.

9. The composition of claim 1, wherein the composition has a sharp decomposition transition beginning at a temperature of less than 200°C.

10. The composition of claim 1, wherein the composition can be stored at about 25°C for at least 100 hours without substantial deposition of metal (0).

11. The composition of claim 1, wherein the composition further comprises at least one solvent for the complex.

12. The composition of claim 1, wherein the solvent is an aromatic hydrocarbon solvent.

13. The composition of claim 1, wherein the metal complex comprises at least 50 wt.% metal.

14. The composition of claim 1, wherein the metal complex comprises at least 70 wt.% metal.

15. The composition of claim 1, wherein the second ligand is a carboxylate, the first ligand is a polydentate amine, the metal is silver or gold, and wherein the solvent is toluene or a xylene.

16. The composition of claim 1, wherein the first ligand has six or fewer carbon atoms.

17. The composition of claim 1, wherein the number of carbon atoms in the complex is twelve or less.

18. A method of producing a conductive metal film comprising:

providing a surface;

providing an ink according to claims 1-17;

depositing the ink on the surface, and heating or irradiating said ink.

19. The method of claim 18, wherein the heating step is carried out using a laser.

20. The method of claim 18, wherein the irradiating step is carried out by photo-irradiation.

21. The method of claim 18, wherein the producing is carried out by heating at a temperature of about 200°C or less.

22. The method of claim 18, wherein the producing is carried out by heating at a temperature of about 150°C or less.

23. The method of claim 18, wherein the film is in the form of a line, and the line has a conductivity of at least 5,000 S/cm.

24. The method of claim 18, wherein the film is in the form of a line, and the line has a work function which is within 25 percent of the work function of the pure metal.

25. The method of claim 18, wherein the film is in the form of a line, and the line has a work function which is within 10 percent of the work function of the pure metal.