Claims:

1. A molecular ink comprising a flake-less screen-printable composition of 30-60 wt% of a C_8-C_{12} silver carboxylate, 0.1-10 wt% of a polymeric ethyl cellulose binder having an average weight average molecular weight (Mw) in a range of 35,000-100,000 g/mol and balance of at least one organic solvent, all weights based on total weight of the composition.

2. The ink according to claim 1, wherein the silver carboxylate is present in an amount of 45-55 wt%.

3. The ink according to any one of claims 1 to 2, wherein the silver carboxylate is silver neodecanoate.

4. A molecular ink comprising a flake-less screen-printable composition of 5-75 wt% of bis(2-ethyl-1-hexylamine) copper (II) formate, bis(octylamine) copper (II) formate or tris(octylamine) copper (II) formate, 0.25-10 wt% of a polymeric ethyl cellulose binder having an average weight average molecular weight (Mw) in a range of 35,000-100,000 g/mol and balance of at least one organic solvent, all weights based on total weight of the composition.

5. The ink according to claim 4, wherein the bis(2-ethyl-1-hexylamine) copper (II) formate, bis(octylamine) copper (II) formate or tris(octylamine) copper (II) formate is present in an amount of 65-75 wt%.

6. The ink according to any one of claims 1 to 5, wherein the composition comprises 0.25-10 wt% of the binder.

7. The ink according to any one of claims 1 to 5, wherein the composition comprises 2.5-5 wt% of the binder.

8. The ink according to any one of claims 1 to 7, wherein the ethyl cellulose comprises a mixture of ethyl celluloses having different molecular weights.

9. The ink according to any one of claims 1 to 8, wherein the average weight average molecular weight is in a range of 60,000-95,000 g/mol.

10. The ink according to claim 8, wherein the ethyl cellulose comprises a mixture of ethyl celluloses comprising a first ethyl cellulose having a weight average molecular weight in a range of from 60,000-70,000 g/mol and a second ethyl cellulose having a weight average molecular weight in a range of from 90,000-100,000 g/mol.

11. The ink according to any one of claims 1 to 10, wherein the solvent comprises an aromatic organic solvent.

12. The ink according to claim 11, wherein the aromatic organic solvent comprises benzene, toluene, ethylbenzene, xylenes, chlorobenzene, benzyl ether, anisole, benzonitrile, pyridine, diethylbenzene, propylbenzene, cumene, isobutylbenzene, *p*-cymene, indane, tetralin, trimethylbenzenes, durene, *p*-cumene, tetralin or any mixture thereof.

13. The ink according to claim 11, wherein the aromatic organic solvent comprises toluene, xylene, anisole, diethylbenzene or any mixture thereof.

14. The ink according to any one of claims 11 to 13, wherein the solvent further comprises a non-aromatic organic solvent in an amount of 75 wt% or less based on the weight of the solvent.

15. The ink according to claim 14, wherein the non-aromatic organic solvent comprises terpineol or octanol and the at least one aromatic solvent comprises xylene.

16. The ink according to any one of claims 1 to 10, wherein the solvent comprises a non-aromatic organic solvent.

17. The ink according to claim 16, wherein the non-aromatic organic solvent comprises terpineol, alpha-terpinene, gamma-terpinene, terpinolene, limonene, pinene, carene, methylcyclohexanols, octanols, heptanols or any mixture thereof.

18. The ink according to claim 16, wherein the non-aromatic organic solvent comprises terpineol, α-terpinene, 2-methylcyclohexanol, 1-octanol or any mixture thereof.

19. The ink according to claim 16, wherein the non-aromatic organic solvent comprises γ-terpinene and 1-octanol.

20. The ink according to claim 19, wherein the non-aromatic organic solvent comprises 2-methylcyclohexanol.

21. The ink according to any one of claims 1 to 10, wherein the solvent comprises diethylbenzene and 1-octanol.

22. The ink according to any one of claims 1 to 21 having a viscosity of 1500 cP or greater.

23. The ink according to claim 1, wherein the composition comprises: 45-55 wt% of silver neodecanoate; 2.5-5 wt% of a mixture of a first ethyl cellulose having a weight average molecular weight in a range of from 60,000-70,000 g/mol and a second ethyl cellulose having a weight average molecular weight in a range of from 90,000-100,000 g/mol; and, balance of an organic solvent comprising a mixture of at least one aromatic solvent and terpineol, all weights based on total weight of the composition.

24. A process for producing a conductive metal trace on a substrate, comprising printing the ink as defined in any one of claims 1 to 23 onto a substrate to form a trace of the ink on the substrate, and sintering the trace of the ink on the printed substrate to form the conductive metal trace.

25. The process according to claim 24, wherein the sintering is performed by heating.

26. The process according to claim 25, wherein the heating is performed at a temperature in a range of 125-250°C.

27. The process according to claim 24, wherein the sintering is performed by photonic sintering.

28. The process according to any one of claims 24 to 27, wherein the sintering is performed for a time in a range of 1-15 minutes.

29. The process according to any one of claims 24 to 28, wherein the printing is screen printing.

30. A printed substrate comprising a conductive trace produced by the process defined in any one of claims 24 to 29.

31. The substrate according to claim 30, wherein, the conductive trace has a thickness of 1 micron or less.

32. The substrate according to claim 31, wherein the thickness is in a range of 0.4-1 micron.

33. The substrate according to any one of claims 30 to 32 comprising polyethylene terephthalate (PET), polyolefin, polydimethylsiloxane (PDMS), polystyrene, polycarbonate, polyimide, a silicone membrane, a textile, paper, glass, metal or a dielectric coating.

34. The substrate according to any one of claims 30 to 32 comprising a polyimide.

35. The substrate according to any one of claims 30 to 34 which is flexible.

36. The substrate according to any one of claims 30 to 35, wherein the conductive trace has a sheet resistance of 5 mOhm/sq/mil or less.

37. The substrate according to claim 36, wherein the conductive trace does not develop an open circuit break over a period of at least 1 day.

38. The substrate according to claim 36 or 37, wherein the conductive trace can maintain said resistance with a change of 10% or less after 10 compressive bend or 10 tensile bend cycles according to ASTM Test F1683-02.

39. The substrate according to any one of claims 36 to 38, wherein the conductive trace can maintain said resistance with a change of 10% or less after 1 compressive or 1 tensile crease cycle according to ASTM Test F1683-02.

40. The substrate according to any one of claims 30 to 39, wherein an adhesive has a bond strength to the conductive trace of 4 lbs or greater without encapsulation according to IPC Shear Force Testing.

41. The substrate according to any one of claims 30 to 40, wherein the conductive trace is screen printed.

42. An electronic device comprising a conductive trace on the substrate as defined in any one of claims 30 to 41.

43. The electronic device according to claim 42, comprising an electrical circuit, a conductive bus bar, a sensor, an antenna (e.g. RFID antennae), a touch sensor, a thin film transistor, a diode or a smart packaging.

44. The electronic device according to claim 42, comprising an RFID antenna.

45. The electronic device according to claim 42, comprising a conductive bus bar.

46. The electronic device according to claim 42, comprising a diode.