Claims

1. A jettable composition, comprising:

a reactive monomer, oligomer or prepolymer containing at least one epoxy or oxetane functional group, wherein

the reactive monomer, oligomer or prepolymer containing at least one epoxy or oxetane functional group comprises one or more of a phenol novolac type epoxy resin, a cresol novolac type epoxy resin and a dicyclopentadiene type epoxy;

a free radical polymerizable compound;

a thermal cross-linking agent comprising an isocyanate compound and optionally a triazine compound, wherein the isocyanate compound is a blocked isocyanate compound; and

a radical initiator.

2. The jettable composition of claim 1, wherein the reactive monomer, oligomer or prepolymer containing at least one epoxy or oxetane functional group further comprises one or more of a bisphenol-A type epoxy resin, bisphenol-F type epoxy resin, cycloaliphatic epoxy compound, epoxy ether, epoxy silane, glycidyl ether, glycidyl ester, glycidyl amine and oxetane monomer.

3. The jettable composition of claim 1 or claim 2, wherein the free radical polymerizable compound comprises one or more vinyl ether containing compound and/or one or more (meth)acrylate group containing compound, or wherein the free radical polymerizable compound comprises a compound having a vinyl ether group and a (meth)acrylate group.

4. The jettable composition of any one of claims 1 to 3, wherein the free radical polymerizable compound does not contain a hydroxyl substituent.

5. The jettable composition of claim 1, wherein the thermal cross-linking agent further comprises a triazine compound, and wherein the triazine compound comprises a tris(alkoxycarbonylamino) triazine, or, wherein the thermal crosslinking agent further comprises a triazine compound, and the free radical polymerizable compound comprises

a hydroxy-containing monomer radical polymerizable compound in a molar ratio of triazine compound to hydroxyl group of no more than 1:2.

6. The jettable composition of any one of claims 1 to 5, wherein the radical initiator comprises one or more photoinitiator and/or one or more thermal initiator.

7. The jettable composition of any one of claims 1 to 7, further comprising one or more reactive diluents, antifoams, anti-tarnishing agents, levelling agents, colorants, pigment dispersants, polymerization inhibitors, surfactants, adhesion promoters, cure accelerators, thixotroping agents or flame retardants.

8. The jettable composition of any one of claims 1 to 7, comprising:

10 wt% or less of one or more reactive monomer, oligomer or prepolymer of an epoxy or oxetane resin;

70 wt% or more of one or more free radical polymerisable compound;

5 wt% or less of one or more thermal cross-linking agent; and

10 wt% or less of one or more radical initiator.

9. The jettable composition of any one of claims 1 to 8, wherein the ratio of reactive monomer, oligomer or prepolymer containing at least one epoxy or oxetane functional group to thermal cross-linking agent is in the range of from 5:1 to 1:5 or in the range of from 3:1 to 1:1.

10. The jettable composition of any one of claims 1 to 19, wherein the reactive monomer, oligomer or prepolymer of an epoxy or oxetane resin comprises an epoxy cresol novolac resin having an epoxy equivalent weight of from 190 g/Eq to 230 g/Eq.

11. A method of manufacturing an electronic device, comprising:

jetting a jettable composition according to any one of claims 1 to 10 onto a dielectric substrate having an electrically conductive pattern on a first surface thereof; and

curing the jetted composition.

12. The method of claim 11, wherein curing the jetted composition comprises exposing the composition to actinic radiation or electron beam radiation concurrent with printing and/or after printing.

13. The method of claim 11 or 12, wherein the jetted composition is thermally treated before, after or concurrent with curing using actinic radiation, for example, thermally treating comprises treatment at a temperature from 80°C to 250°C.

14. The method of any one of claims 11 to 13, wherein the composition is jetted onto the first surface of the dielectric substrate and the electrically conductive pattern.

15. An electronic device, comprising a dielectric substrate having on a first surface thereof an electrically conductive pattern and the composition of any one of claims 1 to 10.

16. The electronic device of claim 15, wherein the composition is in a cured state and/or the dielectric substrate comprises a non-conductive material, for example, a paper/resin composite or a resin/fibre glass composite, a ceramic substrate, a polyester or a polyimide.

17. The electronic device of any one of claims 15 to 16, wherein the electrically conductive pattern is formed from any electrically conductive metal or alloy, for example, the electrically conductive metal or alloy comprises one or more of gold, silver, palladium, nickel, tin, lead, aluminium, and copper.

18. The electronic device of any one of claims 15 to 17, wherein the dielectric substrate further comprises on a second surface thereof an electrically conductive pattern and the composition of any one of claims 1 to 10; and/or wherein the electronic device is a printed circuit board.