Claims

1. A photocurable ink composition comprising:

   (a) a matrix comprising one or more photo-curable or photo-polymerizable monomers, oligomers, polymers, or combinations thereof;

   (b) one or more polymeric diphenyl(2,4,6-trimethylbenzoyl)phosphine oxide (TPO) photo-initiators;

   (c) and one or more pigments, wherein the matrix comprises one or more chain extension agents, wherein the chain extension agent comprises one or more difunctional acrylate polymers or copolymers, and wherein the one or more difunctional acrylate polymer or copolymer comprises a 1,6-hexane ethoxylate diacrylate.

2. The composition of claim 1, wherein the matrix comprises one or more multifunctional crosslinking agents.
3. The composition of claim 2, wherein the multifunctional crosslinking agent comprises one or more trifunctional acrylate polymers or copolymers.
4. The composition of claim 3, wherein the one or more trifunctional acrylate polymers or copolymers comprises a trimethylolpropane ethoxylate triacrylate.
5. The composition of any one of claims 1-4, wherein the matrix comprises one or more reactive diluents.
6. The composition of claim 5, wherein the one or more reactive diluents comprises one or more monofunctional acrylate polymers or copolymers.
7. The composition of claim 6, wherein the one or more monofunctional acrylate polymers or copolymers comprises a cyclic trimethylolpropoylacrylate.
8. The composition of any one of claims 1-7, wherein the matrix comprises one or more monomers, oligomers, polymers, or combinations thereof to improve or enhance surface cure of the matrix.
9. The composition of claim 8, wherein the one or more monomers, oligomers, polymers, or combinations thereof to improve or enhance surface cure of the matrix comprises an amine-modified polyether acrylate.

10. The composition of any one of claims 1-9, wherein the matrix comprises one or more monomers that provide flexibility, elongation, and/or stretch to the matrix.
11. The composition of claim 10, wherein the one or more monomers comprise a urethane acrylate.
12. The composition of any one of claims 1-11, wherein the polymeric TPOL is a linear polymer.
13. The composition of claim 12, wherein the linear polymer is an alkylene oxide polymer or copolymer.
14. The composition of claim 12, wherein the alkylene polymer or copolymer is a polyethylene oxide homopolymer or copolymer.
15. The composition of claim 14, wherein the polyethylene oxide polymer is a polyethylene oxide homopolymer.
16. The composition of any one of claims 1-15, wherein the polymeric TPO is a branched polymer.
17. The composition of claim 16, wherein the branched polymer is a branched alkylene oxide polymer or copolymer.
18. The composition of claim 17, wherein the branched alkylene polymer or copolymer is a branched polyethylene oxide homopolymer or copolymer.
19. The composition of claim 18, wherein the branched polyethylene oxide polymer is a branched polyethylene oxide homopolymer.
20. The composition of any one of claims 1-19, further comprising one or more non-polymeric diphenyl(2,4,6-trimethylbenzoyl)phosphine oxide (TPO) photo-initiators.
21. The composition of any one of claims 1-20, further comprising a plasticizer.
22. The composition of any one of claims 1-21, wherein the ink composition is a yellow ink composition, a magenta ink composition, a cyan ink composition, a black ink composition, a light magenta ink composition, a white ink composition, a light cyan ink composition, or combinations thereof.
23. The composition of any one of claims 1-22, wherein the pigment is at least one of Pigment Blue 1, Pigment Blue 15, Pigment Blue 15:1, Pigment Blue 15:3, Pigment Blue 15:4, Pigment Blue 15:6, Pigment Blue 16, Pigment Blue 17-1, Pigment Blue

22, Pigment Blue 22, Pigment Blue 27, Pigment Blue 28, Pigment Blue 29, Pigment Blue 36, and Pigment Blue 60.

24. The composition of any one of claims 1-23, wherein the pigment is at least one of Pigment Red 3, Pigment Red 5, Pigment Red 8, Pigment Red 9, Pigment Red 9:8, Pigment Red 19, Pigment Red 22, Pigment Red 31, Pigment Red 38, Pigment Red 43, Pigment Red 48:1, Pigment Red 48:2, Pigment Red 48:3, Pigment Red 48:4, Pigment Red 48:5, Pigment Red 49:1, Pigment Red 53:1, Pigment Red 57:1, Pigment Red 57:2, Pigment Red 58:4, Pigment Red 63:1, Pigment Red 81, Pigment Red 81:1, Pigment Red 81:2, Pigment Red 81:3, Pigment Red 81:4, Pigment Red 88, Pigment Red 104, Pigment Red 108, Pigment Red 112, Pigment Red 122, Pigment Red 123, Pigment Red 144, Pigment Red 146, Pigment Red 149, Pigment Red 166, Pigment Red 168, Pigment Red 169, Pigment Red 170, Pigment Red 177, Pigment Red 178, Pigment Red 179, Pigment Red 184, Pigment Red 185, Pigment Red 207, Pigment Red 208, Pigment Red 216, Pigment Red 224, Pigment Red 226, Pigment Red 257, Pigment Violet 3, Pigment Violet 19, Pigment Violet 23, Pigment Violet 29, Pigment Violet 30, Pigment Violet 37, Pigment Violet 50, Pigment Violet 88, Pigment Orange 13, Pigment Orange 16, Pigment Orange 20, or Pigment Orange 36.

25. The composition of any one of claims 1-24, wherein the pigment is at least one of Pigment Yellow 55, Pigment Yellow 74, Pigment Yellow 79, Pigment Yellow 93, Pigment Yellow 110, Pigment Yellow 120, Pigment Yellow 128, Pigment Yellow 138C, Pigment Yellow 139, Pigment Yellow 150, Pigment Yellow 151, Pigment Yellow 155, Pigment Yellow 156, Pigment Yellow 175, Pigment Yellow 180, Pigment Yellow 185 and Pigment Yellow 213.

26. The composition of any one of claims 1-25, wherein the pigment is at least one of Pigment Black 6, Pigment Black 7, Pigment Black 9, lamp or vegetable black, bone or ivory black, and furnace or channel black.

27. An ink set comprising at least a yellow ink composition, a magenta ink composition, a cyan ink composition, and a black ink composition, wherein at least one of the ink compositions comprises the ink composition according to any one of claims 1-26.

28. The ink set of claim 27, wherein at least two of the ink compositions comprises the ink composition according to any one of claims 1-26.

29. The ink set of claim 27, wherein at least three of the ink compositions comprises the ink composition according to any one of claims 1-26.

30. The ink set of claim 27, wherein each of the yellow ink composition, the magenta ink composition, the cyan ink composition, and the black ink composition comprise the ink composition according to any one of claims 1-26.