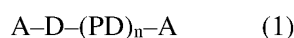


CLAIMS

What is claimed is:

1. A curable composition comprising:
an acid catalyzed urethane (meth)acrylate oligomer comprising an acid catalyst;
a cyanoacrylate monomer;
a metallocene compound;
a free radical polymerization inhibitor; and
an acidic anionic polymerization inhibitor.
2. The curable composition of Claim 1, wherein the acid catalyzed urethane (meth)acrylate oligomer has a structure of at least one of Formula (1) or Formula (2):



wherein each A independently is a monohydroxy functional (meth)acrylate group; each D independently is a di- or tri- functional isocyanate group; each P independently is a polyol having a weight average molecular weight of 100 50 to 12,000 Daltons based on polystyrene standards; and n is 1 to 100.

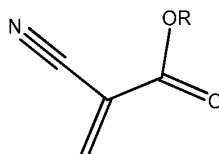
3. The curable composition of any of the preceding claims, wherein the acid catalyzed urethane (meth)acrylate oligomer comprises at least one of:
 - a polyester of hexanedioic acid and diethylene glycol, reacted with isophorone diisocyanate, capped with 2-hydroxyethyl (meth)acrylate;
 - a polypropylene glycol reacted with tolyene-2,6-diisocyanate, capped with 2-hydroxyethyl (meth)acrylate;
 - a polyester of hexanedioic acid and diethylene glycol, reacted with 4,4'-methylenebis(cyclohexyl isocyanate), capped with 2-hydroxyethyl (meth)acrylate;
 - a polyester of hexanedioic acid, 1,2-ethanediol, and 1,2 propanediol, reacted with tolyene-2,4-diisocyanate, capped with 2-hydroxyethyl (meth)acrylate;
 - a polyester of hexanedioic acid, 1,2-ethanediol, and 1,2 propanediol, reacted with 4,4'-methylenebis(cyclohexyl isocyanate), capped with 2-hydroxyethyl (meth)acrylate;
 - a polyester of hexanedioic acid, diethylene glycol, reacted with isophorone diisocyanate, capped with 2-hydroxyethyl (meth)acrylate;
 - a polytetramethylene glycol ether reacted with 4,4'-methylenebis(cyclohexylisocyanate), capped with 2-hydroxyethyl (meth)acrylate; or
 - a polypropylene glycol reacted with tetramethylxylene diisocyanate, capped with 2-hydroxyethyl (meth)acrylate.

4. The curable composition of any of the preceding claims, wherein the curable composition comprises 0.1 to 30 wt% of the acid catalyzed urethane (meth)acrylate based on the total weight of the curable composition.

5. The curable composition of any of the preceding claims, wherein the acid catalyst comprises at least one of a nonmetallic Lewis acid or an organic acid; preferably methane sulfonic acid.

6. The curable composition of any of the preceding claims, wherein the acid catalyst is present in an amount of 0.05 to 6 wt% based on the total weight of the urethane(meth)acrylate oligomer.

7. The curable composition of any of the preceding claims, wherein the cyanoacrylate monomer has the structure



wherein R is a C₁₋₁₅ alkyl, alkoxy alkyl, cycloalkyl, alkenyl, aralkyl, aryl, allyl, or haloalkyl group.

8. The curable composition of any of the preceding claims, wherein the cyanoacrylate monomer comprises at least one of methyl cyanoacrylate, ethyl-2-cyanoacrylate, propyl cyanoacrylate (for example, isopropyl cyanoacrylate), butyl cyanoacrylate, octyl cyanoacrylate, allyl-2-cyanoacrylate, or β -methoxyethyl-2-cyanoacrylate.

9. The curable composition of any of the preceding claims, wherein the curable composition comprises 20 to 98 wt% of the cyanoacrylate monomer based on the total weight of the curable composition.

10. The curable composition of any of the preceding claims, wherein the metallocene compound comprises at least one of ferrocene or a titanocene.

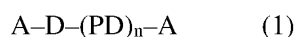
11. The curable composition of any of the preceding claims, wherein the metallocene compound is present in an amount of 0.005 to 4 wt%, or 0.01 to 2 wt% based on the total weight of the curable composition.

12. The curable composition of any of the preceding claims, wherein the free radical polymerization inhibitor comprises at least one of hydroquinone, catechol, beta-naphthol, mono-t-butylhydroquinone, pyrogallol, 4-methoxy phenol, 4-tert-butylphenol, 2,5-di-tert-butylhydroquinone or 2,6-di-tertbutyl-4-methylphenol.

13. The curable composition of any of the preceding claims, wherein the free radical polymerization inhibitor is present in an amount of 0.001 to 1 wt% based on the total weight of the curable composition.
14. The curable composition of any of the preceding claims, wherein the acidic anionic polymerization inhibitor comprises at least one of a lewis acid, a carboxylic acid, or a sulfonic acid.
15. The curable composition of any of the preceding claims, wherein the acidic anionic polymerization inhibitor is present in an amount of 0.001 to 1 wt% based on the total weight of the curable composition.
16. The curable composition of any of the preceding claims, further comprising a multifunctional oligomer.
17. The curable composition of any of the preceding claims, further comprising a multifunctional (meth)acrylate oligomer that comprises at least one of polyethyleneglycol diacrylate, polypropyleneglycol diacrylate, polybutyleneglycol diacrylate, propoxylated trimethylolpropane triacrylate or ethoxylated trimethylolpropane triacrylate.
18. The curable composition of Claim 16 or 17, wherein the multifunctional (meth)acrylate oligomer is present in an amount of greater than 0 to 60 wt% based on the total weight of the curable composition.
19. The curable composition of any of the preceding claims, further comprising a photoinitiator.
20. The curable composition of any of the preceding claims, further comprising a photoinitiator in an amount of greater than 0 to 4 wt% based on the total weight of the curable composition.
21. The curable composition of any of the preceding claims, further comprising a (meth)acrylate monomer.
22. The curable composition of any of the preceding claims, further comprising a (meth)acrylate monomer in an amount of greater than 0 to 30 wt% based on the total weight of the curable composition.
23. The curable composition of any of the preceding claims, further comprising a filler, a silane coupling agent, a photosensitizer, a colorant, a flame retardant, a free radical polymerization initiator, a viscosity modifier, an electrically conductive component, a thermally conductive component, a defoamer, an adhesion promoter, a reactive diluent, or a plasticizer.

24. A curable composition comprising:

0.1 to 30 wt% of an acid catalyzed urethane (meth)acrylate oligomer having a structure of at least one of Formula (1) or Formula (2) that was made with 0.05 to 6 wt% of an acid catalyst based on the total weight of the urethane (meth)acrylate oligomer:



wherein each A independently is a monohydroxy functional (meth)acrylate group; each D independently is derived from a di- or tri- functional isocyanate group; each P independently is derived from a polyol having a weight average molecular weight of 50 to 12,000 Daltons based on polystyrene standards; and n is 10 to 100;

20 to 98 wt% of a cyanoacrylate monomer;

0.005 to 4 wt%, or 0.01 to 2 wt% of a metallocene compound;

0.001 to 1 wt% of a free radical polymerization inhibitor; and

0.01 to 0.1 wt% of an acidic anionic polymerization inhibitor.

25. A cured composition derived from any of the preceding curable compositions.

26. An article or a coating comprising the cured composition of Claim 25, wherein the article can be a medical device, an electronic device, or a nail.

27. A method of making a cured composition comprising:

forming the curable composition of any of Claims 1 to 22; and

curing the curable composition by exposing it to light to form the cured composition.