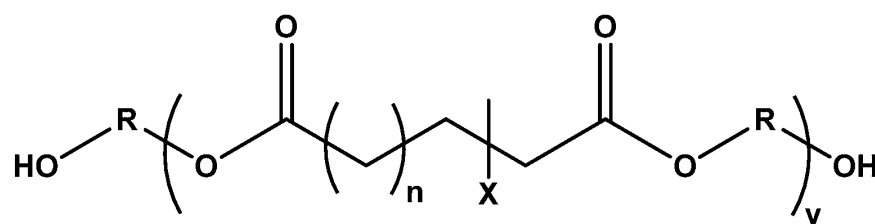


WHAT IS CLAIMED IS:

1. A thermoplastic polyurethane elastomer composition comprising the reaction product of
 - (a) a composition comprising at least one nitro-substituted polyester diol (NO₂-PED), wherein the NO₂-PED is substituted with the nitro group between the two carboxy groups of the NO₂-PED, and at least one polyester diol that is not substituted by a nitro group, wherein the NO₂-PED has the formula:



wherein n is 0-14, y is 1-100, X=H or NO₂, and R is alkylene, alkylene with one or more CH₂ groups substituted by -O-, cycloalkylene, or arylene, wherein at least one X is NO₂

- (b) at least one polyisocyanate, and
 - (c) at least one chain extender.
2. The composition of claim 1, wherein R is alkylene.
3. The composition of claim 1, wherein R is ethylene, propylene, isopropylene, butylene, pentylene, hexylene, heptylene, or octylene.
4. The composition of claim 1, wherein R is alkylene, wherein one or more CH₂ groups are substituted by -O-.
5. The composition of claim 1, wherein R is -(CH₂)_o-O-(CH₂)_o-, CH₃-O-(CH₂)_o-O-(CH₂)_o-CH₃, (CH₃CH(OH)CH₂)₂O, wherein o is 2-4.
6. The composition of claim 1, wherein R is arylene.

7. The composition of claim 1, in which the NO₂-PED before reaction has a molecular weight of 400-10,000 g/mol.
8. The composition of claim 1, wherein the chain extender is a dihydroxyalkane or dihydroxycycloalkane.
9. The composition of claim 8, wherein the chain extender is ethylene glycol, diethylene glycol, triethylene glycol, propylene glycol, dipropylene glycol, tripropylene glycol, 1,3-propanediol, 1,4-butanediol, 1,6-hexanediol, 1,10-decanediol, neo-pentyl glycol, 1,4-cyclohexanedimethanol, 1,4-dihydroxycyclohexane, or mixtures thereof.
10. The composition of claim 1, wherein the chain extender is an alkylene or aralkylene diamine.
11. The composition of claim 10, wherein the chain extender is ethylene diamine, hexamethylene diamine, 1,4-cyclohexanylene diamine, or mixtures thereof.
12. The composition of claim 1, wherein the chain extender is an aromatic diamine.
13. The composition of claim 12, wherein the aromatic diamine is benzidine, dihydroxymethoxy hydroquinone, toluene diamine, diaminodiphenyl methane, phenylene diamine, or mixtures thereof.
14. The composition of claim 1, wherein the chain extender is hydrazine.
15. The composition of claim 1, wherein the chain extender is an amino alcohol.
16. The composition of claim 15, wherein the chain extender is ethanolamine, N-methylethanolamine, N-butylethanolamine, N-oleoylethanolamine, N-cyclohexylisopropanolamine, or mixtures thereof.

17. The composition of claim 1, wherein the chain extender is a substituted aromatic diamine.
18. The composition of claim 17, wherein the chain extender is 4,4'-methylene-bis(o-chloroaniline), 4,4'-methylenebis(3-chloro-2,6-diethylaniline), or mixtures thereof.
19. The composition of claim 1, wherein the thermoplastic polyurethane elastomer composition further comprises at least one crosslinking agent.
20. The composition of claim 19, wherein the at least one crosslinking agent is glycerine, trimethylolpropane, diethanolamine, triethanolamine, or mixtures thereof.
21. The composition of claim 1, wherein a ratio of polyisocyanate to active hydrogen containing group (the NCO index) is from 0.9-1.5.
22. The composition of claim 1, wherein the at least one polyisocyanate is 4,4'-diisocyanatodiphenylmethane (4,4'-MDI), 2,4'-diisocyanato diphenylmethane (2,4'-MDI), p-phenylene diisocyanate, 1,3-bis(isocyanatomethyl)cyclohexane, 1,4-diisocyanato cyclohexane, hexamethylene diisocyanate, isophorone diisocyanate, 1,5-naphthalene diisocyanate, 3,3'-dimethyl-4,4'-biphenyl diisocyanate, 4,4'-diisocyanato-dicyclohexylmethane, 2,6-toluene diisocyanate, 2,4-toluene diisocyanate, or mixtures thereof.
23. The composition of claim 1, further comprising at least one additive comprising:
 - (a) a light stabilizer or a UV stabilizer;
 - (b) an inorganic filler or an organic filler;
 - (c) a silicate mineral, metal oxide, metal salt, clay, metal silicate, glass fiber, natural fibrous material, or a synthetic fibrous mineral;
 - (d) carbon black, fullerene, carbon nanotubes, biochar, melamine colophony, cellulose fibers, polyamide fibers, polyacrylonitrile fibers, polyurethane fibers, polyester fibers based on aromatic and/or aliphatic dicarboxylic acid esters, or carbon fibers; and
 - (e) an organic phosphate, metal polyphosphate, metal oxide, metal salt, or a cyanuric acid derivative;

wherein the additives are present in 0.5-30 percent by weight of the composition.

24. The composition of claim 1, further comprising at least one flame retardant that is an organic phosphate, metal polyphosphate, metal oxide, metal salt, cyanuric acid derivative, or mixtures thereof; wherein the at least one flame retardant is present in 500 to 4000 ppm of the composition.
25. The composition of claim 1, further comprising a foaming agent that is water, pentane, cyclopentane, or a hydrofluorocarbon, or mixtures thereof.
26. The composition of claim 1, wherein the at least one nitro-substituted polyester diol comprises at least one C8-C20 dicarboxylic acid substituted with a single nitro group, and at least one polyol.
27. The composition of claim 26, wherein the at least one polyol is a C₁₋₈ diol.
28. The composition of claim 1, which comprises 20-80% by weight of the nitro-substituted polyester diol.