argon may be used as the blowing agent in a frothing process. Carbon dioxide can also be used as a liquid or as a supercritical fluid.

A surfactant is also used when a polyurethane foam is prepared. A wide variety of silicone surfactants as are commonly used in making polyurethane foams can be used in making the foams with the polymer polyols or dispersions of this invention. Examples of such silicone surfactants are commercially available under the tradenames Tegostab™ (Th. Goldschmidt and Co.), Niax™ (GE OSi Silicones) and Dabco™ (Air Products and Chemicals).

In addition to the foregoing components, the polyurethane formulation may contain various other optional ingredients such as cell openers; fillers such as calcium carbonate; pigments and/or colorants such as titanium dioxide, iron oxide, chromium oxide, azo/diazo dyes, phthalocyanines, dioxazines and carbon black; reinforcing agents such as fiber glass, carbon fibers, flaked glass, mica, talc and the like; biocides; preservatives; antioxidants; flame retardants; and the like.

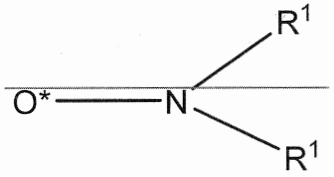
In general, a polyurethane foam is prepared by mixing the polyisocyanate and polymer polyol in the presence of the blowing agent, surfactant, catalyst(s) and other optional ingredients as desired, under conditions such that the polyisocyanate and polyol react to form a polyurethane and/or polyurea polymer while the blowing agent generates a gas that expands the reacting mixture. The foam may be formed by the so-called prepolymer method (as described in U.S. Pat. No. 4,390,645, for example), in which a stoichiometric excess of the polyisocyanate is first reacted with the high equivalent weight polyol(s) to form a prepolymer, which is in a second step reacted with a chain extender and/or water to form the desired foam. Frothing methods (as described in U.S. Pat. Nos. 3,755,212; 3,849,156 and 3,821,130, for example), are also suitable. So-called one-shot methods (such as described in U.S. Pat. No. 2,866,744) are preferred. In such one-shot methods, the polyisocyanate and all polyisocyanate-reactive components are simultaneously brought together and caused to react. Three widely used one-shot methods which are suitable for use in this invention include slabstock foam processes, high resiliency slabstock foam processes, and molded foam methods.

~~The following examples are provided to illustrate the invention, but are not intended to limit the scope thereof.~~ All parts and percentages are by weight unless otherwise indicated.

WHAT IS CLAIMED IS:

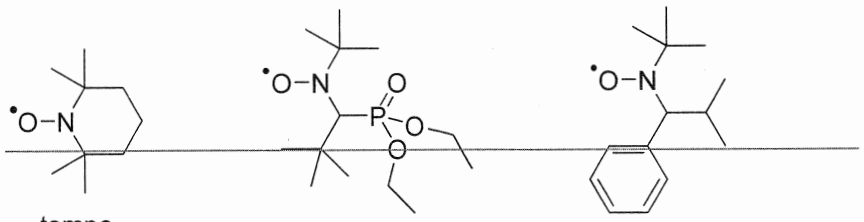
1. A process for making a polymer polyol, comprising forming a dispersion of solid polymer particles in the presence of a continuous liquid polyol phase and a stabilizer copolymer produced by copolymerizing ~~an~~ linear unsaturated polyether which has a molecular weight from 2000 to 20,000 and from 0.2 to 1 polymerizable unsaturated groups per molecule with styrene or a mixture of styrene and one or more ~~copolymerizable low molecular weight unsaturated monomers~~ of acrylonitrile, butadiene, methyl methacrylate, butyl acrylate and vinyl acetate in a nitroxide-mediated polymerization in the presence of TEMPO or SG1 as a nitroxide radical or MAMA-SG1 as an alkoxyamine source for a nitroxide radical, or reversible addition-fragmentation chemical transfer (RAFT) polymerization in the presence of S-1-dodecyl-S'-(α,α'-dimethyl-a"-acetic acid)trithiocarbonate as the RAFT initiator to form a stabilizer polymer or copolymer having a number average molecular weight from 30,000 to 500,000 and an average of 1 to 20 pendant polyether chains per molecule, wherein the solid polymer particles are polystyrene or a copolymer of one or more of acrylonitrile, butadiene, methyl methacrylate, butyl acrylate and vinyl acetate.

~~2. The process of claim 1, wherein the polymerization of the stabilizer polymer or copolymer is performed in the presence of a nitroxide radical having the structure:~~



~~wherein each R^1 group is independently an alkyl or substituted alkyl group provided that the R^1 groups together may form an aliphatic ring structure that includes the nitrogen atom within the aliphatic ring structure.~~

~~3. The process of claim 2, wherein the polymerization of the stabilizer polymer or copolymer is performed in the presence of a nitroxide radical having one or more of the following structures:~~



tempo

SG1

2,2,5-trimethyl-4-phenyl-3-azahexane-3-nitroxide

~~and a separate free radical initiator.~~

~~4. The process of claim 1, wherein the polymerization of the stabilizer copolymer is performed in the presence of an alkoxyamine.~~

25. The process of ~~any preceding~~ claim 1, wherein the stabilizer includes a block copolymer including a first polystyrene block having a molecular weight of at least 18,000 that is devoid of pendant polyether groups and a second block which is a homopolymer of a linear~~n~~ unsaturated polyether which has a molecular weight from 2000 to 20,000 and from 0.2 to 1.0 polymerizable unsaturated groups per molecule or a copolymer of said linear unsaturated polyether with one or more copolymerizable ~~low molecular weight~~ unsaturated monomers, having a molecular weight no greater than 500, the second block containing from 2 to 20 pendant polyether groups that each have a molecular weight from 2000 to 20,000.

~~6. The process of claim 5 wherein the first block is polystyrene.~~

37. A process for making a polymer polyol comprising forming a dispersion of solid polymer particles in the presence of a continuous liquid polyol phase and a stabilizer block copolymer having a first block formed in a first polymerization step in which styrene or a mixture of styrene and one or more ~~low molecular weight monomers~~ of acrylonitrile, butadiene, methyl methacrylate, butyl acrylate and vinyl acetate are polymerized in a controlled radical polymerization in the absence of an unsaturated polyether to produce a living macroinitiator, wherein the controlled radical polymerization is a nitroxide-mediated polymerization in the presence of TEMPO or SG1 as a nitroxide radical or MAMA-SG1 as an alkoxyamine source for a nitroxide radical or reversible addition-fragmentation chemical transfer (RAFT) polymerization in the presence of S-1-dodecyl-S'-(α,α'-dimethyl-a"-acetic acid)trithiocarbonate) as the RAFT initiator, the first block having a molecular weight of at least 18,000 and being devoid of pendant polyether groups and a second block which is a homopolymer of a ~~branched or~~ linear unsaturated polyether which has a molecular weight from 2000 to 20,000 and from 0.2 to 1 polymerizable unsaturated group per molecule or a copolymer of said unsaturated polyether with one or more copolymerizable ~~low molecular weight~~ unsaturated monomers, having a molecular weight no greater than 500, the second block being formed by copolymerizing an unsaturated polyether with one or more ~~low molecular weight~~ monomers, having a molecular weight no greater than 500 in the

presence of the living macroinitiator and containing from 2 to 20 pendant branched or linear polyether groups that each have a molecular weight from 2000 to 20,000, wherein the solid copolymer particles are polystyrene or a copolymer of one or more of acrylonitrile, butadiene, methyl methacrylate, butyl acrylate and vinyl acetate.

~~8. The process of claim 7 wherein the first block is polystyrene.~~

49. The process of any preceding claim, wherein the solid polymer particles are a thermoplastic that has a melting or softening temperature of at least 80°C and the liquid polyol phase includes a polyether polyol.

~~10. The process of any preceding claim, wherein the solid polymer particles are a homopolymer or copolymer of styrene.~~

5~~11~~. The process of any preceding claim wherein the dispersion is formed in a melt dispersion process which includes the steps of (a) mixing a melted thermoplastic polymer with the liquid polyol in the presence of the stabilizer under conditions sufficient to disperse the melted thermoplastic polymer in the form of droplets within a continuous phase of the liquid polyol and (b) cooling the dispersed polymer droplets in the polyol to solidify the polymer droplets and form the polymer polyol.

6~~12~~. The process of any preceding claim wherein the dispersion is formed in an *in situ* polymerization process which includes the steps of polymerizing ~~one or more low molecular weight monomers~~ styrene or a mixture of styrene and one or more of acrylonitrile, butadiene, methyl methacrylate, butyl acrylate and vinyl acetate in the presence of the continuous polyol phase and in the presence of the stabilizer under conditions such that the low molecular weight monomer(s) polymerize to form polymer particles dispersed in the continuous polyol phase.

7~~13~~. A polymer polyol formed in the process of any preceding claim.