The mixtures preferably comprise 99 to 1% by weight of the mixture of at least one diphosphinic acid of the formula (I) and at least one alkylphosphonic acid of the formula (II) as disclosed herein and 1 to 99% by weight of synergist.

Another ~~aspect~~ embodiment relates to a process for preparing the mixtures as disclosed herein, which comprises reacting a phosphinic acid source with an alkyne in the presence of an initiator.

Preferably, the phosphinic acid source is ethylphosphinic acid and the alkyne is acetylene, methylacetylene, 1-butyne, 1-hexyne, 2-hexyne, 1-octyne, 4-octyne, 1-butyn-4-ol, 2-butyn-1-ol, 3-butyn-1-ol, 5-hexyn-1-ol, 1-octyn-3-ol, 1-pentyne, phenylacetylene, trimethylsilylacetylene and/or diphenylacetylene.

The initiator is preferably a free-radical initiator having a nitrogen-nitrogen or an oxygen-oxygen bond.

The free-radical initiator is more preferably 2,2'-azobis(2-amidinopropane) dihydrochloride, 2,2'-azobis(N,N'-dimethyleneisobutyramidine) dihydrochloride, azobis(isobutyronitrile), 4,4'-azobis(4-cyanopentanoic acid) and/or 2,2'-azobis(2-methylbutyronitrile) or hydrogen peroxide, ammonium peroxodisulfate, potassium peroxodisulfate, dibenzoyl peroxide, di-tert-butyl peroxide, peracetic acid, diisobutyryl peroxide, cumene peroxyneodecanoate, tert-butyl peroxyneodecanoate, tert-butyl peroxypivalate, tert-amyl peroxypivalate, dipropyl peroxydicarbonate, dibutyl peroxydicarbonate, dimyristyl peroxydicarbonate, dilauroyl peroxide, 1,1,3,3-tetramethylbutyl peroxy-2-ethylhexanoate, tert-amyl peroxy-2-ethylhexylcarbonate, tert-butyl peroxyisobutyrate, 1,1-di(tert-butylperoxy)cyclohexane, tert-butyl peroxybenzoate, tert-butyl peroxyacetate, tert-butyl peroxydiethylacetate, tert-butyl peroxyisopropylcarbonate, 2,2-di(tert-butylperoxy)butane, tert-amyl hydroperoxide and/or 2,5-dimethyl-2,5-di(tert-butylperoxy)hexane.

12. The mixture as claimed in one or more of claims 1 to 11, which comprises 99 to 1% by weight of a mixture of at least one diphosphinic acid of the formula (I) and at least one alkylphosphonic acid of the formula (II) as claimed in at least one of claims 1 to 10 and 1 to 99% by weight of synergist.

13. The use of mixtures as claimed in at least one of claims 1 to 10 as an intermediate for further syntheses, as a binder, as a crosslinker or accelerator in the curing of epoxy resins, polyurethanes and unsaturated polyester resins, as polymer stabilizers, as crop protection compositions, as sequestrants, as a mineral oil additive, as an anticorrosive, in washing and cleaning composition applications and in electronics applications.

14. The use of mixtures as claimed in at least one of claims 1 to 12 as a flame retardant, especially as a flame retardant for clearcoats and intumescent coatings, as a flame retardant for wood and other cellulosic products, as a reactive and/or nonreactive flame retardant for polymers, for production of flame-retardant polymer molding compositions, for production of flame-retardant polymer moldings and/or for rendering polyester and pure and blended cellulose fabrics flame-retardant by impregnation, and/or as a synergist.

15. A flame-retardant thermoplastic or thermoset polymer molding composition, molding, film, filament or fiber comprising 0.5 to 99.5% by weight of mixtures as claimed in at least one of claims 1 to 12, 0.5 to 99.5% by weight of thermoplastic or thermoset polymer or mixtures thereof, 0 to 55% by weight of additives and 0 to 55% by weight of filler or reinforcing materials, where the sum of the components is 100% by weight.

16. A flame-retardant thermoplastic or thermoset polymer molding composition, molding, film, filament or fiber comprising 1 to 30% by weight of mixtures as claimed in at least one of claims 1 to 12, 10 to 95% by weight of thermoplastic or thermoset polymer or mixtures thereof, 2 to 30% by weight of additives and 2 to 30% by weight of filler or reinforcing materials, where the sum of the components is 100% by weight.

12. The mixture as claimed in one or more of claims 1 to 11, which comprises 99 to 1% by weight of a mixture of at least one diphosphinic acid of the formula (I) and at least one alkylphosphonic acid of the formula (II) as claimed in at least one of claims 1 to 10 and 1 to 99% by weight of synergist.

13. A process for preparing the mixtures as claimed in at least one of claims 1 to 10, which comprises reacting a phosphinic acid source with an alkyne in a solvent in the presence of an initiator.

14. The process as claimed in claim 13, wherein the phosphinic acid source is ethylphosphinic acid and the alkyne is acetylene, methylacetylene, 1-butyne, 1-hexyne, 2-hexyne, 1-octyne, 4-octyne, 1-butyn-4-ol, 2-butyn-1-ol, 3-butyn-1-ol, 5-hexyn-1-ol, 1-octyn-3-ol, 1-pentyne, phenylacetylene, trimethylsilylacetylene and/or diphenylacetylene.

15. The process as claimed in claim 13 or 14, wherein the initiator is a free-radical initiator having a nitrogen-nitrogen or an oxygen-oxygen bond.

16. The process as claimed in claim 15, wherein the free-radical initiator is 2,2'-azobis(2-amidinopropane) dihydrochloride, 2,2'-azobis(N,N'-dimethyleneisobutyramidine) dihydrochloride, azobis(isobutyronitrile), 4,4'-azobis(4-cyanopentanoic acid) and/or 2,2'-azobis(2-methylbutyronitrile) or hydrogen peroxide, ammonium peroxodisulfate, potassium peroxodisulfate, dibenzoyl peroxide, di-tert-butyl peroxide, peracetic acid, diisobutyryl peroxide, cumene peroxyneodecanoate, tert-butyl peroxyneodecanoate, tert-butyl peroxypivalate, tert-amyl peroxypivalate, dipropyl peroxydicarbonate, dibutyl peroxydicarbonate, dimyristyl peroxydicarbonate, dilauroyl peroxide, 1,1,3,3-tetramethylbutyl peroxy-2-ethylhexanoate, tert-amyl peroxy-2-ethylhexylcarbonate, tert-butyl peroxyisobutyrate, 1,1-di(tert-butylperoxy)cyclohexane, tert-butyl peroxybenzoate, tert-butyl peroxyacetate, tert-butyl

peroxydiethylacetate, tert-butyl peroxyisopropylcarbonate, 2,2-di(tert-butylperoxy)butane, tert-amyl hydroperoxide and/or 2,5-dimethyl-2,5-di(tert-butylperoxy)hexane.

17. The process as claimed in one or more of claims 13 to 16, wherein the solvent comprises straight-chain or branched alkanes, alkyl-substituted aromatic solvents, water-immiscible or only partly water-miscible alcohols or ethers, water and/or acetic acid.

18. The process as claimed in claim 17, wherein the alcohol is methanol, propanol, i-butanol and/or n-butanol or comprises mixtures of these alcohols with water.

19. The process as claimed in one or more of claims 13 to 18, wherein the reaction temperature is 50 to 150°C.

20. The use of mixtures as claimed in at least one of claims 1 to 10 as an intermediate for further syntheses, as a binder, as a crosslinker or accelerator in the curing of epoxy resins, polyurethanes and unsaturated polyester resins, as polymer stabilizers, as crop protection compositions, as sequestrants, as a mineral oil additive, as an anticorrosive, in washing and cleaning composition applications and in electronics applications.

21. The use of mixtures as claimed in at least one of claims 1 to 12 as a flame retardant, especially as a flame retardant for clearcoats and intumescent coatings, as a flame retardant for wood and other cellulosic products, as a reactive and/or nonreactive flame retardant for polymers, for production of flame-retardant polymer molding compositions, for production of flame-retardant polymer moldings and/or for rendering polyester and pure and blended cellulose fabrics flame-retardant by impregnation, and/or as a synergist.

22. A flame-retardant thermoplastic or thermoset polymer molding composition, molding, film, filament or fiber comprising 0.5 to 99.5% by weight of mixtures as

claimed in at least one of claims 1 to 12, 0.5 to 99.5% by weight of thermoplastic or thermoset polymer or mixtures thereof, 0 to 55% by weight of additives and 0 to 55% by weight of filler or reinforcing materials, where the sum of the components is 100% by weight.

23. A flame-retardant thermoplastic or thermoset polymer molding composition, molding, film, filament or fiber comprising 1 to 30% by weight of mixtures as claimed in at least one of claims 1 to 12, 10 to 95% by weight of thermoplastic or thermoset polymer or mixtures thereof, 2 to 30% by weight of additives and 2 to 30% by weight of filler or reinforcing materials, where the sum of the components is 100% by weight.