Epoxy resin curing indicator

Claims:

1. Composition comprising
   a) at least one epoxy resin and/or reactive diluents,
   b) at least one hardener for the at least one epoxy resin,
   c) at least one curing indicator, which is a polymeric colourant consisting of chromophores which are chemically bound to polymers having reactive groups,

   wherein the hardener for the epoxy resin is no acid and no anhydride and

   wherein the colour of the composition changes depending on the curing degree.

2. Composition according to claim 1, wherein the hardener is an aminic hardener.

3. Composition according to claim 1, wherein the hardener is selected from the group consisting of hardeners based on aliphatic, cycloaliphatic, heterocyclic, aromatic amines, polyaminoamides, their adducts with epoxy derivatives and mixtures thereof.

4. Composition according to claim 1, wherein the hardener is selected from catalysts for the homopolymerisation.

5. Composition according to claim 1, wherein the curing indicator is a polymeric colourant that consists of polymers and chromophores, the chromophores being chemically bound to the polymers which have reactive groups, the polymers being polyols.

6. Composition according to claim 1 further comprising
   d) additives selected from the group consisting of toughening

agents, thixotropic additives or fine particle fillers, air release, wetting agents, defoamers, coupling agents,non-reactive substances acting as plasticisers, inorganic or organic fillers and mixtures thereof.

7. Composition according to claim 1 consisting of
   a) at least one epoxy resin and/or reactive diluents,
   b) a hardener for the at least one epoxy resin, and
   c) at least one curing indicator, which is a polymeric colourant consisting of chromophores which are chemically bound to polymers having reactive groups, or

consisting of
   a) at least one epoxy resin and/or reactive diluents,
   b) a hardener for the at least one epoxy resin,
   c) at least one curing indicator, which is a polymeric colourant consisting of chromophores which are chemically bound to polymers having reactive groups, and
   d) additives selected from the group consisting of toughening agents, thixotropic additives or fine particle fillers, air release, wetting agents, defoamers, coupling agents,non-reactive substances acting as plasticisers, inorganic or organic fillers and mixtures thereof.

8. Process for determining sufficient cure of a composition comprising
   i) providing a composition comprising at least one epoxy resin and at least one hardener for the epoxy resin,
   ii) adding at least one curing indicator, which is a polymeric colourant consisting of chromophores which are chemically bound to polymers having reactive groups, to the epoxy resin, the hardener and/or the already mixed composition,
   iii) applying curing conditions to the coloured composition until the composition changes its colour.

9. Process according to claim 8, wherein the curing indicator is a polymeric colourant that consists of polymers and chromophores, the chromophores being chemically bound to the polymers which have reactive groups, the polymers being polyols.

10. Process according to claim 8, wherein the hardener is selected from the group consisting of hardeners based on aliphatic, cycloaliphatic, heterocyclic, aromatic amines, polyaminoamides, their adducts with epoxy derivatives and mixtures thereof.

11. Use of polymeric colourants as curing indicators.

12. Use according to claim 11, for epoxy resin compositions.

13. Use of the compositions according to any of of claims 1 to 7 for coating and casting applications and/or in pipe relining systems.

14. Use of the compositions according to any of of claims 1 to 7 in engineering, construction, electrical insulation, pipe relining, coating, tooling, for composites and structural adhesives.

Claims:

1. Composition comprising
   a) at least one epoxy resin and/or reactive diluents,
   b) at least one aminic hardener for the at least one epoxy resin,
   c) at least one curing indicator, which is a polymeric colourant that consists of polymers and chromophores, the chromophores being chemically bound to the polymers which have reactive groups, the polymers being polyols,

   wherein the hardener for the epoxy resin is no acid and no anhydride and

   wherein the colour of the composition changes depending on the curing degree.

2. Composition according to claim 1, wherein the hardener is selected from the group consisting of hardeners based on aliphatic, cycloaliphatic, heterocyclic, aromatic amines, polyaminoamides, their adducts with epoxy derivatives and mixtures thereof.

3. Composition according to claim 1, wherein the hardener is selected from catalysts for the homopolymerisation.

4. Composition according to claim 1 further comprising
   d) additives selected from the group consisting of toughening agents, thixotropic additives or fine particle fillers, air release, wetting agents, defoamers, coupling agents,non-reactive substances acting as plasticisers, inorganic or organic fillers and mixtures thereof.

5. Composition according to claim 1 consisting of
   a) at least one epoxy resin and/or reactive diluents,
   b) a hardener for the at least one epoxy resin, and

c) at least one curing indicator, which is a polymeric colourant consisting of chromophores which are chemically bound to polymers having reactive groups, or

consisting of

a) at least one epoxy resin and/or reactive diluents,

b) a hardener for the at least one epoxy resin,

c) at least one curing indicator, which is a polymeric colourant consisting of chromophores which are chemically bound to polymers having reactive groups, and

d) additives selected from the group consisting of toughening agents, thixotropic additives or fine particle fillers, air release, wetting agents, defoamers, coupling agents,non-reactive substances acting as plasticisers, inorganic or organic fillers and mixtures thereof.

6. Process for determining sufficient cure of a composition comprising

i) providing a composition comprising at least one epoxy resin and at least one hardener for the epoxy resin,

ii) adding at least one curing indicator, which is a polymeric colourant consisting of chromophores which are chemically bound to polymers having reactive groups, to the epoxy resin, the hardener and/or the already mixed composition,

iii) applying curing conditions to the coloured composition until the composition changes its colour.

7. Process according to claim 6, wherein the curing indicator is a polymeric colourant that consists of polymers and chromophores, the chromophores being chemically bound to the polymers which have reactive groups, the polymers being polyols.

8. Process according to claim 6, wherein the hardener is selected from the group consisting of hardeners based on aliphatic, cycloaliphatic, heterocyclic, aromatic amines, polyaminoamides, their adducts with

epoxy derivatives and mixtures thereof.

9. Use of polymeric colourants as curing indicators for epoxy resin compositions.

10. Use of the compositions according to any of claims 1 to 5 for coating and casting applications and/or in pipe relining systems.

11. Use of the compositions according to any of claims 1 to 5 in engineering, construction, electrical insulation, pipe relining, coating, tooling, for composites and structural adhesives.