volume fractions of polystyrene in high-styrene-content hardeners.

It is therefore desired to provide a hardener system for epoxy resins without these disadvantages.

Summary ~~of the Invention~~

In a first aspect, there is provided a composition comprising:

a) an epoxy resin; and

b) a hardener comprising a copolymer of: i) an ethylenically unsaturated anhydride, and ii) a vinyl compound, wherein said vinyl compound is styrene or a styrene derivative and wherein said copolymer has an anhydride content of less than 15 weight percent, based on the total weight of said copolymer;

wherein said composition is prepared from a halogen-containing compound;

wherein said copolymer is present in an amount in the range of from about 10 weight percent to about 90 weight percent, based on the total weight of said composition.

In an embodiment of the ~~invention~~disclosure a composition is disclosed comprising, consisting of, or consisting essentially of: a) an epoxy resin; and b) a hardener comprising a copolymer of: i) an ethylenically unsaturated anhydride, and ii) a vinyl compound, wherein the vinyl compound is styrene or a styrene derivative and wherein the copolymer has an anhydride content of less than 15 weight percent, based on the total weight of said copolymer;

wherein the composition is prepared from a halogen-containing compound.

In a second aspect, there is provided a varnish produced from the composition as defined above.

In a third aspect, there is provided a prepreg prepared from the varnish as defined above.

In a fourth aspect, there is provided an electrical laminate prepared from the varnish as defined above.

In a fifth aspect, there is provided a printed circuit board prepared from the varnish as defined above.

In a sixth aspect, there is provided a coating prepared from the varnish as defined above.

In a seventh aspect, there is provided a composite prepared from the varnish as defined above.

In an eighth aspect, there is provided a casting prepared from the varnish as defined above.

In a ninth aspect, there is provided an adhesive prepared from the varnish as defined above.

Detailed Description

In an embodiment of the invention, a composition is disclosed comprises, consists of, or consists essentially of: a) an epoxy resin; and b) a hardener comprising a copolymer of: i) an ethylenically unsaturated anhydride, and ii) a vinyl compound, wherein the vinyl compound is styrene or a styrene derivative and wherein the copolymer has an anhydride content of less than 15 weight percent, based on the total weight of the copolymer;

wherein the composition is prepared from a halogen-containing compound.

Copolymers of an ethylenically unsaturated anhydride and a vinyl compound, include for example, styrene-maleic anhydride copolymer (SMA) and others, for example, as described in WO 95/06075, incorporated herein by reference.

In an embodiment, the copolymers of styrene and maleic anhydride can have a molecular weight (Mw) in the range of from 10,000 to 50,000 and an anhydride content of less than 15 weight percent. Commercial examples of these copolymer materials include but are not limited to SMA EF60 and SMA EF80 having styrene-maleic anhydride ratios of 6:1 and 8:1 respectively and weight average molecular weights

That which claimed is:

1. A composition comprising:

a) an epoxy resin; and

b) a hardener comprising a copolymer of: i) an ethylenically unsaturated anhydride, and ii) a vinyl compound, wherein said vinyl compound is styrene or a styrene derivative and wherein said copolymer has an anhydride content of less than 15 weight percent, based on the total weight of said copolymer;

wherein said composition is prepared from a halogen-containing compound; wherein said copolymer is present in an amount in the range of from about 10 weight percent to about 90 weight percent, based on the total weight of said composition.

2. A composition in accordance with claim 1 further comprising a solvent in an amount in the range of from 30 to 60 weight percent, based on the total weight of said composition.

3. A composition in accordance with claim 1 wherein said halogen-containing compound is selected from the group consisting of tetrabromobisphenol-A (TBBA) and tetrabromobisphenol F.

4. A composition in accordance with claim 1 wherein said epoxy resin is produced by contacting a glycidyl ether with a bisphenol compound to form oxazolidinone moieties.

5. A composition in accordance with claim 4 wherein said epoxy resin is produced by contacting a glycidyl ether with a bisphenol compound and a polyisocyanate.

6. A composition in accordance with claim 1 wherein said epoxy resin is selected from the group consisting of a phenolic epoxy resin, a novolac epoxy resin, a benzoxazine resin, an aryl cyanate resin, an aryl triazine resin, a maleimide resin, and combinations of any two or more thereof.

7. A varnish produced from the composition of claim 1.

8. A prepreg prepared from the varnish of claim 7.

9. An electrical laminate prepared from the varnish of claim 7.

10. A printed circuit board prepared from the varnish of claim 7.

11. A coating prepared from the varnish of claim 7.

12. A composite prepared from the varnish of claim 7.

13. A casting prepared from the varnish of claim 7.

14. An adhesive prepared from the varnish of claim 7.