these dendritic polymer compositions, the trade-off is that solvent-based coatings may display inferior pencil hardness and chemical resistance if solvent is trapped in the highly cross-linked cured film and cannot be removed. The hazardous nature of organic solvents in a coating composition also limits the area of applications.

Accordingly, there is a need to provide a polymer composition that overcomes, or at least ameliorates, one or more of the disadvantages described above. In particular, it is an object of the present invention to provide a polymer composition that is capable of forming high performance coatings, with near-zero or zero VOC emissions and at the same time, display improved pencil hardness, chemical resistance relative to conventional solvent-based coatings.

Summary

In ~~a first aspect~~an embodiment, there is provided a polymer composition comprising: (i) one or more functionalized dendritic polymers; and (ii) a reactive diluent that is capable of being chemically coupled to the functional groups of the dendritic polymers, wherein when said dendritic polymer is coupled to said reactive diluent in the presence of a cross-linker, a polymerized solid is formed at high concentrations in a liquid medium.

In an aspect, there is provided a coating composition, comprising:

(i) one or more functionalized dendritic polymers; and

(ii) a reactive diluent chemically coupled to the functional groups of the dendritic polymers by one or more cross-linkers, wherein the coating composition has a solids content of at least 55% by weight in a liquid medium.

In one embodiment, the concentration of the polymerized solid is at least 55% in the liquid medium.

In one embodiment, the liquid medium may comprise an organic solvent or an aqueous solvent. In another embodiment, the polymer composition may be substantially devoid of the liquid medium.

Advantageously, the presence of the reactive diluent substantially reduces or completely negates the need for

Further advantageously, as a consequence of requiring little or no organic solvent in the polymer composition, the disclosed compositions possess a relatively high concentration of polymerized solids (or "high solids content") compared to conventional solvent-based polymer compositions. A high solids content is advantageous in that for a same thickness of coating film, a lesser amount of such high solids content polymer compositions is needed compared to polymer compositions having a lower solids content, for providing comparable coating properties.

In another aspect, there is provided a two component (2K) coating composition, comprising:

(i) one or more functionalized dendritic polymers; and

(ii) a reactive diluent that is capable of being chemically coupled to the functional groups of the dendritic polymers, wherein when said dendritic polymer is coupled to said reactive diluent in the presence of a cross-linker, a polymerized solid is formed at a concentration of at least 55% by weight in a liquid medium,

in one component; and

(iii) one or more cross-linkers in the other component.

In ~~a second aspect~~another embodiment, there is provided a method of preparing a high solids, two-component (2K) coating composition, said method comprising the steps of: (a) providing a first component comprising: (i) one or more functionalized dendritic polymers; (ii) a reactive diluent capable of being chemically coupled to the functional groups of the dendritic polymers, wherein when said dendritic polymer is coupled to said reactive diluent in the presence of a cross-linker, a polymerized solid is formed at high concentrations in a liquid medium; and (b) providing a second component comprising;

(i) one or more cross-linkers; (c) mixing said first and second components to form said coating composition.

In an aspect, there is provided a method of preparing a high solids, two-part (2K) coating composition, said method comprising the steps of:

(a) providing a first component comprising:

(i) one or more functionalized dendritic polymers;

(ii) a reactive diluent that is capable of being chemically coupled to the functional groups of the dendritic polymers, wherein when said dendritic polymer is coupled to said reactive diluent in the presence of a cross-linker, a polymerized solid is formed at a concentration of at least 55% by weight in a liquid medium;

(b) providing a second component comprising;

(i) one or more cross-linkers;

(c) mixing said first and second components to form said coating composition.

Advantageously, the disclosed method may be performed without the use of an organic solvent or with substantially reduced amounts of an organic solvent to thereby form coatings with near-zero or zero VOC emissions. Further advantageously, as the dendritic polymers are miscible with the reactive diluent, the said first component is stable for prolonged storage even in the absence of solvent and may be mixed with cross-

linkers just prior to applying the coating composition onto a surface.

In ~~a third aspect~~another embodiment, there is provided a method of preparing a high solids, single component (1K) coating composition, said method comprising the steps of: providing a polymer composition comprising: (i) one or more functionalized dendritic polymers; (ii) a reactive diluent capable of being chemically coupled to the functional groups of the dendritic polymers, wherein when said dendritic polymer is coupled to said reactive diluent in the presence of a cross-linker, a polymerized solid is formed at high concentrations in a liquid medium,; and (iii) one or more blocked cross-linkers.

In another aspect, there is provided a method of preparing a high solids, single component (1K) coating composition, said method comprising the steps of:

(a) providing a polymer composition comprising:

(i) one or more functionalized dendritic polymers;

(ii) a reactive diluent that is capable of being chemically coupled to the functional groups of the dendritic polymers, wherein when said dendritic polymer is coupled to said reactive diluent in the presence of a cross-linker, a polymerized solid is formed at a concentration of at least 55% by weight in a liquid medium; and

(iii) one or more melamine resins and/or blocked cross-linkers.

Advantageously, the coating composition may be curable upon the application of heat. In one embodiment, the 1K coating composition can be cured by heating the coating composition to unblock the cross-linkers so that they may react with the functional groups of the dendritic polymer to form a cross-linked network thereof.

Advantageously, the disclosed method of the third aspect may be performed without the use of an organic solvent or with substantially reduced amounts of organic solvent to thereby form coating compositions with substantially reduced or zero VOC emissions.

In yet another ~~aspect~~embodiment, there is provided a coating composition comprising: (i) one or more functionalized dendritic polymers; and (ii) a reactive diluent that is capable of being chemically coupled to the functional groups of the dendritic polymers, wherein when said dendritic polymer is coupled to said reactive diluent in the presence of a cross-linker, a polymerized solid is formed at high concentrations in a liquid medium; and (iii) one or more cross-linkers.

In another ~~aspect~~embodiment, there is provided the polymer composition according to the first aspect for use in the preparation of a single component (1K) coating composition wherein the dendritic polymer, reactive diluent and cross-linker are in a single component.

In still another ~~aspect~~embodiment, there is provided the polymer composition according to the first aspect for use in the preparation of a two-component (2K) coating composition wherein the dendritic polymer and the reactive diluent are in one component and a crosslinker is in the other component.

Definitions

The following words and terms used herein shall have the meaning indicated:

As used herein, the terms "organic solvent" or "solvent" are used interchangeably throughout the present specification to refer to organic compounds capable of dissolving substantially hydrophobic polymers. Exemplary solvents may include but are not limited to non-polar and aprotic solvents, such as, acetones, dichloromethane (DCM), tetrahydrofuran (THF), ethyl acetate (EtOAc), dimethylformamide (DMF), acetonitrile, and dimethyl sulfoxide (DMSO), butyl acetate (BA) and or mixtures thereof.

As used herein, the term "solids content" is taken to refer to the concentration of non-volatile material (such as polymerized solids) contained in a polymer composition. More particularly, the term refers to the non-volatile material left behind after volatile components such as a solvent (which serves as a carrier or vehicle for the polymer composition) has been removed from the polymer composition.

Claims

1. A coating composition, comprising:

(i) one or more functionalized dendritic polymers; and

(ii) a reactive diluent chemically coupled to the functional groups of the dendritic polymers by one or more cross-linkers, wherein the coating composition has a solids content of at least 55% by weight in a liquid medium.

2. The ~~polymer~~coating composition of claim 1, wherein the liquid medium comprises an organic solvent or an aqueous solvent.

3. The ~~polymer~~coating composition of any one of claims 1 to 2, wherein said liquid medium is absent.

4. The coating composition of claim 3, wherein the solids content is about 100%.

5. The coating composition of any one of the preceding claims, wherein said reactive diluent is selected from one or more compounds having an average molecular weight of less than or equal to 500.

6. The coating composition of claim 5, wherein said reactive diluent is selected from one or more compounds having an average molecular weight of less than or equal to 200.