PRESSURE SENSITIVE ADHESIVE COMPOSITION INCLUDING ULTRAVIOLET LIGHT-ABSORBING OLIGOMER

Cross-Reference to Related Applications

This application claims priority to U.S. Provisional Application Nos. 62/017,666, filed June 26, 2014, and 62/017,021, filed June 25, 2014, the disclosures of which are incorporated by reference in their entirety herein.

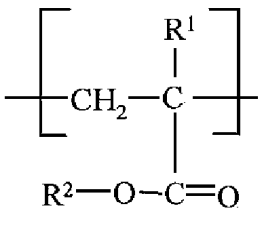
Background

It may be desirable to incorporate ultraviolet absorbers (UVAs) into materials exposed to ultraviolet (UV) radiation, for example, to protect from UV degradation. Some UVAs can be dispersed into some compositions, but sometimes they can be lost due to volatilization or migration to the surface. Covalent incorporation of UVAs into pressure sensitive adhesive (PSA) compositions has been proposed (see JP2012188620 published October 4, 2012.) Certain copolymers made from monomers having UV absorbing groups have been described for including in PSA compositions (see, JP2000123621, published April 28, 2000).

Summary

The present disclosure provides a composition that includes a pressure sensitive adhesive and an ultraviolet light-absorbing oligomer having a first divalent unit with a pendent ultraviolet absorbing group. The oligomers are generally quite compatible with pressure sensitive adhesives and do not migrate out of the adhesive. Compositions including the pressure sensitive adhesive and oligomers provide protection from ultraviolet light and have good transparency to visible and infrared light. These properties are typically well-maintained even after accelerated UV exposure and exposure to high temperature and humidity conditions.

The present disclosure provides a composition that includes a blend of a pressure sensitive adhesive and an ultraviolet light-absorbing oligomer. The ultraviolet light-absorbing oligomer includes a first divalent unit having a pendent ultraviolet absorbing group and a second divalent unit represented by formula:



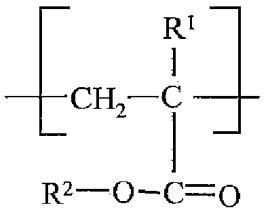
in which R^1 is hydrogen or methyl, and R^2 is alkyl having from 4 to 22 carbon atoms. In some embodiments, the pressure sensitive adhesive is an acrylic pressure sensitive adhesive comprising the

second divalent unit, and wherein for at least some of the second divalent units in the pressure sensitive adhesive R^2 is alkyl having the same number of carbon atoms as at least some of the second divalent units in the ultraviolet light-absorbing oligomer.

In an aspect, there is a composition comprising a blend of a pressure sensitive adhesive and an ultraviolet light-absorbing oligomer, wherein the ultraviolet light-absorbing oligomer comprises:

first divalent units comprising a pendent ultraviolet absorbing group; and

second divalent units represented by formula:



;

wherein

R^1 is hydrogen or methyl; and

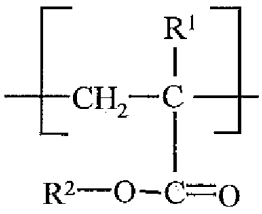
R^2 is alkyl having from 4 to 20 carbon atoms,

and wherein the pressure sensitive adhesive is an acrylic pressure sensitive adhesive comprising the second divalent units, and wherein for at least some of the second divalent units in the pressure sensitive adhesive R^2 is alkyl having the same number of carbon atoms as at least some of the second divalent units in the ultraviolet light-absorbing oligomer.

The composition may be useful, for example, for adhering a film to a surface of an article or adhering any two surfaces together. Accordingly, the present disclosure provides an article that includes the composition. The article may be, for example, photovoltaic device or a film with the composition disposed on at least a portion of a surface thereof. The film may be, for example, a vehicle wrap, graphic film, architectural film, window film, or barrier film.

In another aspect, there is an article comprising the composition as defined above, wherein the article is a photovoltaic device, vehicle wrap, graphic film, architectural film, or window film.

The present disclosure provides an assembly including a first polymeric film substrate having a first surface and a second surface opposite the first surface, a barrier film disposed on the first surface of the first polymeric film, a pressure sensitive adhesive layer having a first surface and a second surface opposite the first surface, with the first surface of the pressure sensitive adhesive disposed on the barrier film opposite the first polymeric film substrate, and a second polymeric film substrate disposed on the second surface of the pressure sensitive adhesive layer. The pressure sensitive adhesive layer includes an ultraviolet light-absorbing oligomer with a first divalent unit having a pendent ultraviolet absorbing group and a second divalent unit represented by formula:



,

in which R^1 is hydrogen or methyl, and R^2 is alkyl having from 4 to 22 carbon atoms.

In another aspect, there is an assembly comprising:

a first polymeric film substrate having a first surface and a second surface opposite the first surface;

a barrier film disposed on the first surface of the first polymeric film;

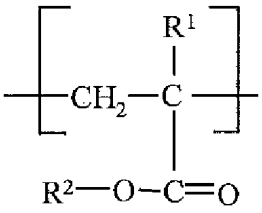
a pressure sensitive adhesive layer having a first surface and a second surface opposite the first surface, wherein the first surface of the pressure sensitive adhesive is disposed on the barrier film opposite the first polymeric film substrate; and

a second polymeric film substrate disposed on the second surface of the pressure sensitive adhesive layer,

wherein pressure sensitive adhesive layer comprises an ultraviolet light-absorbing oligomer comprising:

first divalent units comprising a pendent ultraviolet absorbing group; and

second divalent units represented by formula:



;

wherein

R^1 is hydrogen or methyl; and R^2 is alkyl having from 4 to 20 carbon atoms.

UVAs in pressure sensitive adhesives (PSA) are useful for protecting both the PSA and underlying films or structures from UV light. With conventional UVAs, there can be issues with migration out of the adhesive layer as well as agglomeration and resulting optical defects. The ultraviolet light-absorbing oligomers disclosed herein have superior compatibility in PSA formulations when compared to commercially available UVAs of the same class as evidenced by clarity and transmission of the PSAs. Furthermore, in some embodiments, the second divalent units and optionally third divalent units in the ultraviolet light-absorbing oligomers disclosed herein are the same as those in the PSA formulation. Increased compatibility as evidenced by clarity and transmission data is observed in these embodiments in comparison to oligomers in which the major portion is derived from methyl methacrylate.

In this application:

Terms such as "a", "an" and "the" are not intended to refer to only a singular entity, but include the general class of which a specific example may be used for illustration. The terms "a", "an", and "the" are used interchangeably with the term "at least one".