[0006] In a first aspect, a method of preparing a crosslinked pressure-sensitive adhesive is provided. The method includes exposing at least one radiation crosslinkable pressure-sensitive adhesive composition to radiation from at least one light-emitting diode to crosslink the radiation crosslinkable pressure-sensitive adhesive composition and thereby form the cross-linked pressure-sensitive adhesive, wherein the crosslinked pressure-sensitive adhesive comprises a hot melt processable pressure-sensitive adhesive. The at least one radiation crosslinkable pressure-sensitive adhesive composition comprises (a) a polymerized reaction product of components, (b) optionally at least one non-photocrosslinkable (co)polymer, (c) optionally at least one radiation-sensitive crosslinker, (d) optionally at least one adjuvant, and (e) optionally at least one tackifier. The polymerized reaction product of components comprises i) at least one alkyl (meth)acrylate monomer, ii) optionally at least one acid-functional ethylenically unsaturated monomer, iii) optionally at least one non-acid-functional ethylenically unsaturated monomer, iv) at least one initiator, and v) optionally at least one radiation-sensitive crosslinker. The pressure-sensitive adhesive composition comprises at least one radiation-sensitive crosslinker, and the least one radiation-sensitive crosslinker is a photocrosslinker, which upon irradiation, becomes excited to a higher energy state in which it can abstract a hydrogen atom from a hydrogen-donating molecule, thereby generating on the hydrogen-donating molecule a free radical capable of further reaction.

[0007] In a second aspect, a radiation crosslinked pressure-sensitive adhesive prepared according to the method of the first aspect is provided.

[0008] In a third aspect, an adhesive article is provided. The adhesive article includes a flexible backing layer and the radiation crosslinked pressure-sensitive adhesive prepared according to the method of the first aspect.

[0009] The above summary of the present disclosure is not intended to describe each disclosed aspect or every implementation of the present disclosure. The description that follows more particularly exemplifies illustrative embodiments. In several places throughout the application, guidance is provided through lists of examples, which examples can be used in various combinations. In each instance, the recited list serves only as a representative group and should not be interpreted as an exclusive list.

Detailed Description

[0010] Pressure-sensitive adhesives (PSAs) are known to possess properties including the following: (1) aggressive and permanent tack, (2) adherence with no more than finger pressure, (3) sufficient ability to hold onto an adherend or substrate, and (4) sufficient cohesive strength to be removed cleanly from the adherend. Materials that have been found to function well as PSAs include polymers designed and formulated to exhibit the requisite viscoelastic properties resulting in a desired balance of tack, peel adhesion, and shear holding power. PSAs are characterized by being normally tacky at room temperature (e.g., 20°C). PSAs do not embrace compositions merely because they are sticky or adhere to a surface.

[0011] These adhesive characteristics are assessed generally by means of tests which are designed to individually measure tack, adhesion (peel strength), and cohesion (shear holding power), as noted in A.V. Pocius in Adhesion and Adhesives Technology: An Introduction, 2nd Ed., Hanser Gardner Publication, Cincinnati, OH, 2002. These measurements taken together constitute the balance of properties often used to characterize a PSA.

[0012] With broadened use of pressure-sensitive adhesive tapes over the years, performance requirements have become more demanding. Shear holding capability, for example, which originally was intended for applications supporting modest loads at room temperature, has now

CLAIMS

1. A method of preparing a crosslinked pressure-sensitive adhesive comprising exposing at least one radiation crosslinkable pressure-sensitive adhesive composition to radiation from at least one light-emitting diode to crosslink the radiation crosslinkable pressure-sensitive adhesive composition and thereby form the crosslinked pressure-sensitive adhesive, wherein the crosslinked pressure-sensitive adhesive comprises a hot melt processable pressure-sensitive adhesive, and wherein the at least one radiation crosslinkable pressure-sensitive adhesive composition comprises:

a) a polymerized reaction product of components comprising:

i) at least one alkyl (meth)acrylate monomer;

ii) optionally at least one acid-functional ethylenically unsaturated monomer;

iii) optionally at least one non-acid-functional ethylenically unsaturated monomer;

iv) at least one initiator; and

v) optionally at least one radiation-sensitive crosslinker;

b) optionally at least one non-photocrosslinkable (co)polymer;

c) optionally at least one radiation-sensitive crosslinker;

d) optionally at least one adjuvant; and

e) optionally at least one tackifier,

wherein the pressure-sensitive adhesive composition comprises at least one radiation-sensitive crosslinker and wherein the least one radiation-sensitive crosslinker is a photocrosslinker, which upon irradiation, becomes excited to a higher energy state in which it can abstract a hydrogen atom from a hydrogen-donating molecule, thereby generating on the hydrogen-donating molecule a free radical capable of further reaction.

2. The method of claim 1, wherein the at least one light-emitting diode provides radiation having a wavelength in the range of 200 to 600 nm.

3. The method of claim 1 or 2, wherein the at least one light-emitting diode provides radiation having a wavelength in the range of 300 to 400 nm.

4. The method of any of claims 1 to 3, wherein the at least one light-emitting diode provides radiation having a wavelength range of no more than 10 nm.

5. The method of any of claims 1 to 4, wherein the at least one tackifier is present in an amount greater than 10 parts per weight per 100 parts by weight of total monomer, or in an amount from 40 parts to 70 parts by weight per 100 parts by weight of total monomer.

6. The method of any of claims 1 to 5, wherein the at least one radiation-sensitive crosslinker is selected from the group consisting of para-acryloxybenzophenone (ABP), para-acryloxyethoxybenzophenone (AEBP), para-N-(methylacryloxyethyl)-carbamoylethoxybenzophenone, 4-acryloyloxydiethoxy-4-chlorobenzophenone, para-acryloxyacetophenone, ortho-acrylamidoacetophenone, acrylated anthraquinones, acrylated benzophenone derivatives, and combinations thereof.

7. The method of any of claims 1 to 6, wherein the at least one radiation-sensitive crosslinker is present in an amount of at least 0.05 parts by weight per 100 parts by weight of total monomer.

8. The method of any of claims 1 to 7, wherein the at least one optional non-acid-functional ethylenically unsaturated monomer is present and comprises a hydrogen-donating monomer.

9. The method of any of claims 1 to 8, wherein the at least one adjuvant is present and comprises a radiation-crosslinkable additive, a thickener, a particulate filler, an antioxidant, a colorant, a scent, or combinations thereof.

10. The method of claim 9, wherein the radiation-crosslinkable additive comprises at least one bis(benzophenone).

11. The method of any of claims 1 to10, wherein c) is present and comprises a crosslinking polymer.

12. The radiation crosslinked pressure-sensitive adhesive prepared by the method of any of claims 1 to 11.

13. An adhesive article comprising the radiation crosslinked pressure-sensitive adhesive prepared by the method of any of claims 1 to 11 and a flexible backing layer.