



UV CURABLE PRESSURE SENSITIVE ADHESIVE

This invention relates to UV curable pressure sensitive adhesives.

Pressure sensitive adhesives are used in a variety of applications due to their ease of handling and instant bond. Materials are available that can be used at either hot or cold temperatures, but a material that can service both of these environments has remained elusive. For example, it would be desirable to provide a pressure sensitive adhesive that can be used under the hood in automotive applications. However, materials that provide a sufficiently strong bond at elevated temperatures embrittle and lose adhesion at cold temperatures, while those that have strength and flexibility at cold temperatures become soft and weak at elevated temperatures.

This invention is a UV curable adhesive composition comprising a polyacrylate containing pendant photosensitive moieties, a vinyl ether, and an onium salt photoinitiator. The composition is a liquid at ambient temperature and cures with UV irradiation to a pressure sensitive adhesive with good peel strength through the range of 85°C to -40°C.

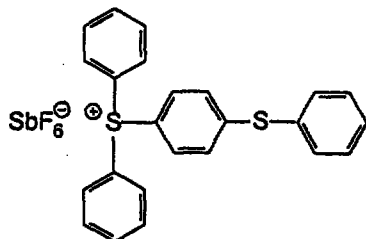
The polyacrylate is a saturated polymeric chain prepared from acrylate monomers, which chain also contains pendant photosensitive moieties. The pendant photosensitive groups are attached to the polyacrylate with linkages of sufficient length to promote intermolecular bonding. The polymer typically will have a weight average molecular weight in the range of 2,000-10,000. The preferred polyacrylate is that sold commercially under the tradename ACRONAL 3429 and ACRONAL 3458 by BASF. The polyacrylate will be present in a composition having 100 parts by weight in a range of 60 to 90 parts by weight.

The preferred vinyl ethers are low in viscosity, and have T_g values within the range of -50°C to +10°C. Particularly preferred vinyl ethers are the C₄ to C₁₀ vinyl ethers. The ether may also contain hydroxy groups. Exemplary vinyl ethers are butyl vinyl ether, ethylhexyl vinyl ether, ethyl vinyl ether, isopropyl vinyl ether, cyclohexyl vinyl ether, isobutyl vinyl ether, and hydroxy- butyl vinyl ether. The more preferred vinyl ether is butyl vinyl ether. The vinyl ether will be present in a composition having 100 parts by weight in a range of 10 to 40 parts by weight.

9902954-8

18 JUN 1999

The preferred onium salt photoinitiators are those diaryliodonium, triarylsulfonium, and ferrocenium salts that are known to initiate cationic cure. Such salts are described in detail in US patents 4,069, 055 and 4,058,401 to Crivello. A preferred onium salt is sulfonium hexafluoroantimonate, available from Union Carbide, and having the structure



These initiators will be present in any effective amount to initiate the cure process, and customarily will be present in amounts of 0.1 to 10 parts, preferably 1 to 4 parts by weight per 100 parts by weight of the polyacrylate and vinyl ether.

10 EXAMPLE

Several adhesive composition samples according to this specification were prepared and compared to typical UV curing adhesive systems for peel strength in the following manner. Each composition was applied to a Mylar substrate and irradiated with UV light from a 300 watt Fusion UV systems, D type bulb for 3 seconds. The substrate was 6 cm from the light source. The cured coated films were then bonded to each other by applying a 5 pound rubber roller to the mated bonded laminate. The laminate was then cut into 2.54 cm (1 inch) wide by 15.24 cm(6 inch) length sections for 180° peel testing. Peel tests were conducted on an Instron Tensile Unit.

The composition of the samples, and the result of the peel strength tests are reported in the following table. The composition of the samples is given in parts by weight. Irgacure is the tradename of a standard photoinitiator available from Ciba Geigy. The peel strength values are reported in n/m. Sample compositions A and B are the inventive samples; compositions C and D are standard formulations for UV curable adhesives.



COMPOSITION	A	B	C	D
in parts by weight				
Acronal 3429	75	75	75	75
Butyl Vinyl Ether	25			
Ethylhexyl Vinyl Ether		25		
Ethylhexyl Acrylate			25	
Tetrahydrofurfuryl Acrylate				25
Sulfonium hexafluoroantimonate	1	1		
Irgacure 1173			1	1
Peel Values in N/meter				
-40°C	400	550	400	350
22°C	800	850	250	300
85°C	530	450	50	70

The data show that for sample compositions A and B, the peel strength values are superior than those for the standard formulations.

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What is claimed is:



1. A UV curable adhesive composition comprising
 - (i) 60-90 parts by weight of a polyacrylate having pendant photosensitive
5 moieties,
 - (ii) 10-40 parts by weight of a vinyl ether, and
 - (iii) 1-4 parts by weight based on the weight of the polyacrylate and vinyl ether, of
an onium salt photoinitiator.
- 10 2. The adhesive composition according to claim 1 in which the polyacrylate is selected from the group of polyacrylates sold under the tradename ACRONAL 3429 and ACRONAL 3458 by BASF.
3. The adhesive composition according to claim 1 in which the vinyl ether has a low
15 viscosity and a Tg value within the range of -50°C to +10°C.
4. The adhesive composition according to claim 1 in which the vinyl ether is selected from the group consisting of butyl vinyl ether, ethylhexyl vinyl ether, ethyl vinyl ether, isopropyl vinyl ether, cyclohexyl vinyl ether, isobutyl vinyl ether, and hydroxybutyl vinyl
20 ether.
5. The composition according to claim 1 in which the photoinitiator is sulfonium hexafluoroantimonate.

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