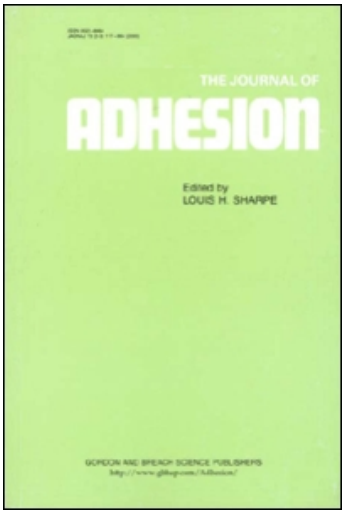

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Vol. 27 No. 3 1991

Contents

Analysis of Surface Segregation of Acrylate Copolymer/Fluoro-copolymer Blends by Corresponding States Theory

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Abstract

The surface segregation behavior of the acrylate copolymer/fluoro-copolymer blends was investigated with the compatibility obtained by Prigogine-Flory-Patterson's theory and the surface tension γ_s. It was

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expected that the acrylate copolymer/fluoro-copolymer blends were revealed to be the phase separation system by the state parameters, i.e. the thermal expansion coefficient α, the reference temperature T^* and the reference pressure P^*. The phase separation for the acrylate copolymer/fluoro-copolymer blends was also confirmed by the DSC thermograms and the thermophotometry. Next, the γ_s of copolymers were evaluated on the basis of Prigogine's corresponding state theory, as extended for surfaces by Patterson and co-workers

$$\tilde{\gamma}_s = \gamma_s / k^{1/3} \cdot P^{*2/3} \cdot T^{*1/3}$$

$$\tilde{\gamma}_s \cdot V^{5/3} = 0.29 - (1 - \tilde{V}^{1/3}) \cdot \ln[(V^{1/3} - 0.5)/(V^{1/3} - 1)]$$

where the $\tilde{\gamma}_s$, K and $\tilde{V}$ are reduced surface tension, Boltzmann constant and reduced volume, respectively. The value of γ_s of the acrylate copolymer and the fluoro-copolymer were estimated to be 28.3 and 19.1 (dyn/cm), respectively. Consequently, it was supposed that the occurrence of surface segregation of acrylate copolymer/fluoro-copolymer blends was affected by the compatibility and the variation in γ_s.

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Modification and Characterization of Ethylene-Vinyl Acetate Copolymer by Grafting with Poly (Methyl Methacrylate) Macromonomers

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Abstract

The modification of ethylene-vinyl acetate copolymer (EVA) was attempted by graft reaction of poly(methyl methacrylate) (MMA) macromonomers, and their adhesive and mechanical properties were investigated. It was confirmed that macromonomers could be grafted onto EVA, but the graft polymer having the higher degree of grafting and graft efficiency couldn't be prepared. It was found that properties of resulting graft polymers were influenced by the molecular weight and number of graft chains, particularly the peel strength and melt flow rate were more dependent on the molecular weight than number of graft chains. The peel strength by the graft polymers having graft chains of low molecular weight and their tensile strengths were higher than those of the graft copolymer grafted with MMA.

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Contents

Acetylene Terminated Polyimide Adhesive (Part 2)

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Abstract

The application of acetylene terminated polyimide oligomers (isoimide and florinated type) to high temperature adhesive is investigated.

Adhesive shows excellent high temperature adhesive strength (130Kgf/cm^2 lap shear strength at 260°C). Necessary temperature and pressure at cure is considerably lower than for linear polyimide adhesives. Strengths after 260°C 1000 hours heat treatment in air are the same as initial and strengths after 290°C 1000 hours and 370°C 24 hours in air are slightly lower than initial. Adhesive strengths of both isoimide and florinated type are almost the same.

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Contents

Rolling Friction Coefficient of Natural Rubber/Rosin system Pressure-Sensitive Adhesives. I. Pulling Cylinder Method

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Abstract

Tack of pressure-sensitive adhesives (PSAs) is often measured by the rolling ball method. By analyzing the rolling motion of a ball on PSAs, we can evaluate the rolling friction coefficient f that depends on physical property of the materials. But velocity of a rolling ball decreases with time and f varies with velocity, because PSA is a viscoelastic material. Therefore in order to determine f of PSAs by rolling ball method we must make some assumptions concerning velocity dependence of f and make complicated analysis.

We have proposed the pulling cylinder method to determine f of PSAs to avoid such complication. In this method a cylinder is pulled on a PSA at constant velocity, and calculation of f is very simple, and velocity dependence of f can be analyzed by pulling the cylinder at various velocities. But f determined by this method depends not only on property of the materials but also on dimensions of the cylinder.

In this paper, we studied on the influence of dimensions of the cylinder which is the basic factor for the pulling cylinder method upon f. Radius R, length b and mass M are varied independently.

(a) f is proportional to the reciprocal of cylinder mass M, provided that b and R are kept constant. In addition, f becomes almost zero when talc is coated on the surface of PSAs to eliminate adhesion effect. This means that the extensional deformation of PSAs (effect of adhesion) is the major factor, and the compressive deformation (effect of cylinder sinking) is negligible.

(b) f is proportional to the cylinder length b, provided that M and R are kept constant. Therefore values of f for cylinders of different length can be reduced to each other.

(c) f increases as the cylinder radius R increases.

Above-mentioned facts experimentally verified the validity of the fundamental postulation in the theory previously proposed.

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Effects of Isocyanates or Epoxides on Water and Heat Resistance of Cyanoacrylate Adhesive

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Abstract

Various isocyanates and epoxy compounds were blended with ethyl-2-cyanoacrylate (CA) and the effects on water and heat resistance of those blends were investigated. The blended isocyanates, such as hexamethylene-diisocyanate (HDI), 4,4'-diphenylmethanediisocyanate (MDI), tolylene-2,4-diisocyanate (TDI) and 3-triethoxysilylpropylisocyanate (KBE9007), were used, and the blended epoxides, such as bisphenol A diglycidylether (EPIKOTE828), diglycidylterephthalate (BLENMER-DGT), triglyci-

dylisocyanurate (TGI) and N, N, N', N'-Tetraglycidyl-m-xylenediamine (TETRAD-X), were used. Steel plates were adhered by blended adhesives and the tensile shear strength after water soak and heat resistant temperature were measured. The results were as follows. The shear strength after water soak increased in both blending systems, particularly HDI (17%) and TGI (5%). And the initial adherence improved on some blending systems, such as TDI (9%), MDI (17%), EPIKOTE828 (9%)/TGI (1%) and BLENMER-DGT (1%)/TGI (5%), from 1.5 to 2.5 times. Heat resistant temperature increased from 2 to 17°C in epoxides blending system.

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Contents

Rolling Friction Coefficient of Natural Rubber/Rosin System Pressure-Sensitive Adhesives II. Dependency of Rolling Friction Coefficient upon Viscoelastic Property of Pressure-Sensitive Adhesives

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Abstract

Tack of pressure-sensitive adhesives (PSAs) is closely related to rolling friction coefficient f, which depends greatly upon dynamic mechanical properties of the material. In this study, pressure sensitive adhesives of natural rubber/rosin system with varying blend ratios are prepared, then f and 180° peel strength P of them are measured as a function of velocity v.

It is shown that a peak in the plot of f vs. log v for lower T (E″ max) or Tg is found at higher velocity.

This trend is qualitatively in agreement with the predictions due to the theory previously proposed.

It is also ascertained that the velocity dependence of f obtained in the rolling ball experiment has the same tendency as that obtained in the pulling cylinder experiment in the velocity range from 10 to 100 cm/sec.

The velocity dependence of P is quite similar to that of f for the same pressure sensitive adhesives, but P has its maximum at higher velocity than f has. P involves only debonding process, whereas f involves both bonding process and debonding process.

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The Development of New Structural Urethane Adhesives for Use in Elevator Panels.

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Abstract

New urethane-based structural adhesives and primer with enhanced adhesive properties have been developed. The products simplify the production of decorative panels for elevators, which are produced in a large variety of small lots. The new urethane adhesives make it possible to use identical assembly procedures for assembling all panel types regardless of the finishing material.

Decorative panels made using the urethane adhesives were tested and found to match the performance of previous panels. Thanks to the use of lightweight, rigid reinforcing materials and thin, high strength finishing materials, substantial weight savings are achieved.

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