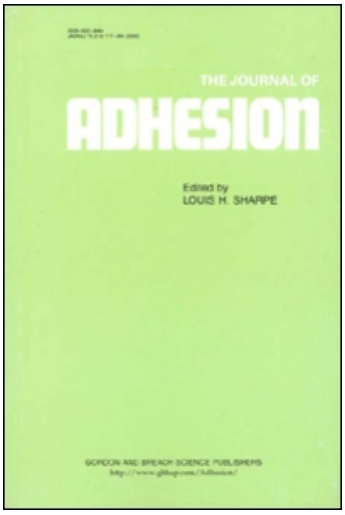

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Contents

An Experimental Study on Improvement of Adhering Strength of Fibrin Glue by Using Soluble Silk Fibroin

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Abstract

Tissue adhesives have been prepared from fibrinogen, one of the clotting elements of blood. This material is available commercially for clinical uses such as the anastomoses of nerve, microvascular surgery, dural closing, bone graft fixation, skin graft fixation, and other soft tissue fixation. On the other hand, the adhering strength of the fibrin glue has not necessarily been achieved until now, and we have been trying to improve the adhering strength.

In this study, we tried to improve the adhering strength of fibrin glue by blending appropriate amount of soluble silk fibroin, *Antheraea pernyi*, into the fibrinogen aqueous solution. In addition, it was found to be effective to apply ultrasonic vibration just after mixing the adhesives for a short time for improving the adhering strength.

It was found that the adhering strength of fibrin glue containing soluble silk fibroin increased almost 2 times compared to the case without silk fibroin. Application of ultrasonic vibration onto the adhesive site for 1 min has also been found to be effective for increasing the adhering strength of the fibrin glue.

(Received: March 4, 1991)

Strength Evaluation of Bonded Joints Using a Ductile Adhesive (Part 1: Strength Prediction based on the mechanics of materials)

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Abstract

A strength analysis method for joints bonded with a ductile adhesive was investigated. The mechanics of materials which has been frequently applied for joints bonded with a brittle adhesive was applied to prediction of strength of the joints. Two types of mechanical tests were carried out. One was a tensile test using butt joints and the other was a lap shear test using single lap joints. To calculate the strength of these joints, five kinds of fracture criteria considering both elastic and elastic-plastic deformations in the adhesive layer were used. The calculated values of the strength were compared with the experimental values. It became clear that it was difficult to predict precisely the strength of both types of joints bonded with a ductile adhesive by means of the theory of strength analysis based on the mechanics of materials even if a nonlinear deformation of the adhesive was taken into account.

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Contents

Separation of EEA Modified PDMS from Chloroform Solution

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Abstract

Ethylene-ethyl acrylate copolymer (EEA) modified polydimethylsiloxane (PDMS) was separated from the surface of its chloroform solution by evaporation of solvent at successive times at 45°C. PDMS contents of the separated fractions were measured by FTIR. It was observed that PDMS content was higher in the earlier fractions and decreased with time. When the experimental results were compared with the calculated PDMS contents for a separation model composed of three separation factors, the separating rate of PDMS was estimated to be about 10 times higher than that of EEA. It was suggested that the contents of PDMS homopolymer and EEA-PDMS blockcopolymer increased with increases of PDMS contents in EEA modified PDMS.

(Received: June 29, 1991)

Theoretical Equation of Surface Tension and Its Application, Part V. Calculation of the Surface Tension of Ice at 0°C—A Supplement to Part I.

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Abstract

In 1988, the present author presented Eq. (2) as a theoretical equation of surface tension.

$$\gamma = \epsilon \cdot n_s \cdot 0.25 \cdot \alpha \qquad (2)$$

Here, ϵ, n_s and α are the cohesive energy per molecule, the number of molecules per cm^2 of the surface and the compensating factor, respectively. The values of ϵ and n_s of ice and water at 0°C are shown in Table 1 (in Text). Because ice is a crystalline assembly of H_2O molecules which are linked by hydrogen bonds, H_2O molecule itself is considered to be almost nonpolar. Accordingly, α of ice should be in the range of $0.5 \sim 0.6$. Thus, γ of ice at 0°C is calculated as 106 ± 10 erg cm^2.

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Surface Polymeric Modifier of Polypropylene

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Abstract

The preparation of a modifier was investigated for the surface modification of polypropylene (PP). A modifier was prepared with the graft polymerization of maleic anhydride (MAH) onto a blend of low molecular weight PP (LPP) and ethylene-acrylic acid copolymer (EAA) in the presence of dicumyl peroxide in a mixer. The degree of grafting of MAH increased with decreasing molecular weight of LPP and content of EAA. In compounding of this modifier in PP, it was found that the contact angle of the surface of PP decreased with increasing degree of grafting, and the adhesion on urethane coating, epoxy adhesives and cyanoacrylate adhesives was better, and that this modifier was effective as a surface polymeric modifier of PP.

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Contents

Peel Adhesion Apparatus Using the Circular Motion of the Compound Pendulum and its Evaluation

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Abstract

An apparatus for measuring the peel adhesive behavior of pressure sensitive adhesive (PSA) tapes is developed using the circular motion of the compound pendulum. The peel behavior in two processes of increasing and decreasing rates of peeling can be measured in a half cycle of rotation of the pendulum. A personal computer plays the important roles of operating the automated system and data-processing in real time.

To test the practical performance of the apparatus, the relation between peel force and rate of peeling is investigated over the rate range from 2×10^{-4} to 1×10^{2}mm/s. Values of the peel force in the cohesive or interfacial failure regions agree with those obtained from the conventional testing under constant rate. It appears that a peel hysteresis exists in the transition region between their failures.

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Peeling Behavior in Adhesive Joints of Steel Sheets

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Abstract

It was found from a peeling test in adhesive joints of steel sheets that the peel strength of steel sheets with high yield strength (HT) was lower than that of steel sheets with low yield strength (MS) and a cohesive failure occurred in an adhesive layer of both joints. The reason why the apparent peel strength of HT did not agree with that of MS was investigated in this paper.

The adhesive joints of MS fractured holding a constant distance between a loading axis and a crack front, because a plastic deformation of the steel sheet occurred easily near the crack tip. So, the peeling load was kept constant during the crack propagation. On the other hand, the adhesive joints of HT fractured holding an initial shape of the sheet, because of high stiffness of the steel sheet. As the crack front departed from the load axis during a peeling test, the applied load decreased with increasing of distance between a loading axis and a crack front. In this case the bending moment at the crack tip was kept constant. A stress distribution in the adhesive layer was also investigated using the finite element analysis.

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