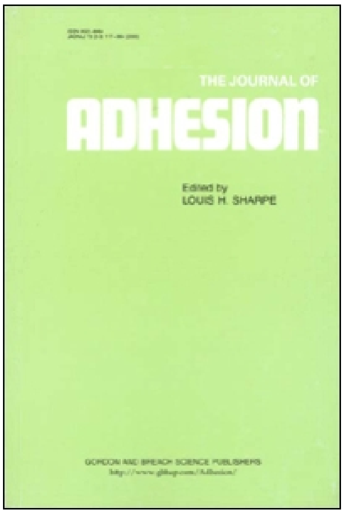

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Stress–Strain Analysis by Boundary Element Method and Strength Test of Adhesive Bonded Joints

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Abstract

The stress–strain analysis program by Boundary Element Method for a micro-computer had been produced by us before. It was improved for a computer whose memory is larger than a micro-computer's so as to increase a number of analytical element.

In this study, we analyzed stress–strain of various adhesive bonded joints and measured joint strengths. In order to ascertain the accuracy of numerical solutions by this program we predicted these joint strengths by use of these solutions and compared the predicted joint strengths with the measured values. At this, we took that adhesive destruction occurs to follow the Maximum Principal Stress Theory, by measuring the shear strength and tensile strength of cylindric adhesive butt joints.

The predicted joint strengths were generally same as the measured values. As the results, the accuracy of numerical solutions by this program could be confirmed.

(Received: October 1, 1985)

Synthesis and Applications of Poly(tetrahydrofuran) Ionene Part 2. Influence of Molecular Weight of Dimethylamino-terminated Poly(tetrahydrofuran) Prepolymer on Physical Properties of Poly(tetrahydrofuran) Ionene

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Abstract

In order to study the influence of the molecular weight of dimethylamino-terminated poly(tetrahydrofuran)(AT-PT) on the physical properties of poly(tetrahydrofuran) ionene (PTI), PTIs were prepared from AT-PTs having various molecular weight and α,α'-dichloro-p-xylene by the Menschutkin reaction. Each PTI was found to exhibit the high tensile strength (T_B) and the elongation at break (E_B). Especially, PTI prepared from AT-PT with the molecular weight of 3800 was found to have $T_B = 39.6$ MPa and $E_B = 710\%$. It was presumed that their superior tensile behavior was attributable to the strain induced crystallization of the

poly(tetrahydrofuran) main chain. PTIs were found to be easily dissolved in alcohols and chloroform. It was found that PTI prepared from AT-PT having molecular weight of 2170 was water-soluble. PTIs were found to have the high peel strength for Bakelite. The peel strength for Bakelite was increased with the increase of cationic concentration of PTI main chain, i.e., with the decrease of the molecular weight of AT-PT.

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Internal Stress of Bisphenol-A Type Epoxide resins Modified with Phenoxy Resin

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Abstract

Bisphenol-A type epoxide resin was modified with different amounts of Phenoxy resin to reduce the internal stress of the cured resins, and the mechanism for reducing the intenal stress was investigated in detail.

In the region where the amount of Phenoxy resin added was less than 19 wt.%, the cured resins formed homogeneous structure and their internal stress was generated in proportion to the shrinkage in the glassy region. In this region, the internal stress was slightly decreased with increasing the amount of Phenoxy resin added. This is due to the reduction of the shrinkage in the glassy region as a result of the decrease of the glass transition temperature with the addition of Phenoxy resin.

In the region where the amount of Phenoxy resin added was 28 to 35 wt.%, the cured resins formed a two phase structure composed of the epoxide resin matrix and Phenoxy dispersed phase. In this region, the internal stress was remarkably reduced with the addition of Phenoxy resin. This reduction of internal stress is attributed to the decrease of the modulus in the temperature region over the glass transition of the Phenoxy resin phase and to the relaxation of internal stress caused by the Phenoxy resin phase.

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Average Ultimate Shear Stress of Adhesive-bonded Single Lap Joint Between Different Materials

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Abstract

The average ultimate shear stress τ_u of the adhesive-bonded single lap joint with a given length of overlap l, a given thickness of adhesive layer d, a given thickness of

adherend t_1, t_2, a given width of adherend b, and a given mean diameter of adhesive layer D, under tensile load, can be calculated from the following formulas:
a) In the case of the adhesive-bonded single lap joint between different materials, $\tau_u = P_B/(bl)$,

$$\tau_{ud} = \sigma_{B1}t_1/l = \sigma_{B2}t_2 l$$
$$\tau_{ui} = \tau_B/\alpha = (\tau_B/3.6)\sqrt{(E_2/G_a(d/l)}$$
$$\tau_{us} = 13\sigma_{B1}(G_a/E_1)(t_1/d)$$
$$\tau_{ut} = \tau_B$$

b) In the case of the adhesive-bonded tubular lap joint between different materials, $\tau_u = P_B/(\pi Dl)$,

$$\tau_{ud} = \sigma_{B1}(t_1/l)\{1-(t_1/D)\} = \sigma_{B2}(t_2/l)\{1+(t_2/D)\}$$
$$\tau_{ui} = \tau_B/\alpha = (\tau_B/3.6)\sqrt{(E_2/G_a)(d/l)}$$
$$\tau_{us} = 13\sigma_{B1}(G_a/E_1)(t_1/d)\{1-(t_1/D)\}$$
$$\tau_{ut} = \tau_B$$

Here E_1 and σ_{B1} represent the modulus of longitudinal elasticity and the tensile strength, respectively, of the adherend, and E_2 and σ_{B2} represent those of the another adherend ($E_1 > E_2$). G_a and τ_B represent the modulus of transverse elasticity and the shear strength, respectively, of the adhesive, and α represents the stress concentration factor.

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