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Contents Lists and Abstracts from the Journal of the Adhesion Society of Japan*

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Enzymatic Hydrolysis of Copoly (N-hydroxypropyl-DL-glutamine) *In vitro*

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and TOSHIO HAYASHI

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(Accepted for publication : March 12, 1999)

Random copolypeptides [PHPDLG] consisting of N-hydroxypropyl-D-glutamine and N-hydroxypropyl-L-glutamine. Covering the whole range of DL-copolymer composition were prepared by carrying out aminolysis reactions with 3-amino-1-propanol [P] on starting random copolypeptides [PBDLG] consisting of γ -benzyl-D-glutamate and γ -benzyl-L-glutamate. The effects of copolymer composition and sequential distributions on the rate of enzymatic hydrolysis by ficin in the pseudo-extracellular fluid [PECF] at pH 7.4 and 37.0°C were studied to simulate *in vivo* polymer degradation. Enzymatic hydrolysis data for these samples followed the Michaelis-Menten rate law, being of the first order to the enzyme concentration. It was shown that the rate of enzymatic hydrolysis of PHPDLG by ficin was controlled by the comonomer composition as well as sequential distributions of comonomers in the copolymer chains.

(Received : January 7, 1999)

Evaluation of the Preparation Conditions of Metal Surface for Adhesive Bonding

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(Accepted for publication : April 5, 1999)

To confirm the condition for surface treatment of a test panel, Round Robin Tests (R.R.T) were carried out using two kinds of stainless steel plate (2B and BA of SUS 304). The test conditions were based on the new ISO 4588 (Adhesive-Guidelines for the preparation of metal surfaces for adhesive bonding) and the present ISO. The testing results were analyzed using the signal to noise (S/N) ratio in consideration of the adhesive strength and the measurement error. The finished surface roughness of the test panel affects the adhesive strength. The results by the new methods proposed as ISO standards indicate that the adhesive strength is higher than that by the present method, and the distribution of the adhesive strength is changed by each test conditions. Since the obtained adhesive strength depends on the surface condition of the adherend, the treatment conditions of adherend should be noted in the standard. The preparation with the chromic acid mixture solution, which was standardized in new ISO, was found to increase the adhesive strength with 2B. These results suggest that the discussion on distribution by the results of R.R.T should be necessary when guideline of surface preparation for the test panel is standardized.

(Received : December 7, 1998)

Silane and Polymer Treatment of Calcium Carbonate Particles and Mechanical Properties of the Filled Poly(Vinyl Chloride)

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(Accepted for publication : February 26, 1999)

The effect of the surface treatment of ground calcium carbonate particles with a silane coupling agent or polymer on the yield strength was investigated in the particle-filled poly(vinyl chloride). First, the particles were treated with γ -aminopropyl methyldiethoxysilane as a silane coupling agent, however, there was no influence of the treatment on the improvement of yield strength. Second, the polymer treatment using poly(methyl methacrylate) containing carboxyl groups was carried out, because poly(methyl methacrylate) has well compatibility with poly(vinyl chloride) matrix. The particles having mean size of about 1 μm were treated with the polymer through the acetone solution. A portion of the matrix poly(vinyl chloride) was also added in the solution during the treatment process to improve the dispersibility of particles in the matrix. The composite was prepared using the obtained mixture and the tensile test was carried out. As a result, it was found that the polymer treatment was useful to improve the yield strength of calcium carbonate particle-filled poly(vinyl chloride).

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*Deceased.

Influence of Native Oxide Layer of Aluminum Film on Destructive Strength of Cu–Al Multilayer Structure

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(Accepted for publication : May 11, 1999)

The improvement of destructive strength of Cu–Al multilayer structure is regarded as one of the important problems on the view point of micro electronic device fabrication. However, native oxide layer can be formed easily on aluminum film surface by exposing to air. By the destruction test of the multilayer structure, it is found that the interface destruction occurs mainly at the native oxide layer on the aluminum film. Moreover, the native oxide of Al film prevents to form intermixing layer between Cu and Al layers. The native oxide layer strongly affects to adhesion strength of multilayer.

(Received : January 14, 1999)

Three-dimensional Finite Element Analysis of Stress Response in Adhesive Scarf Joints Subjected to Impact Tensile Loads

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(Accepted for publication : June 3, 1999)

The stress wave propagation and the stress distribution in adhesive scarf joints of similar adherends subjected to impact tensile loads are analyzed in an elastic deformation using three-dimensional finite-element method (FEM). An impact load is applied to a joint by dropping a weight. The one end of upper adherend is fixed and the other end of the lower adherend is subjected to an impact load. FEM code employed is DYNA3D. The Effects of scarf angles of the adherends, the adhesive thickness and Young's modulus of the adherends on the stress wave propagation at the interfaces are examined. It is found that the maximum value of the maximum principal stress σ_1 appears at the interface of the lower adherend subjected to the impact load. In the cases of scarf angle of 45, 52.47 and 60 degree, the maximum value of maximum principal stress decreases and stress distributions at the interface become to be more homogeneous. The effect of adhesive layer thickness was found to be small on the maximum stress in this joint. The maximum stress increases as Young's modulus of adherends increases. In addition, experiments were carried out to measure the strain response of adhesive scarf joints subjected to impact tensile loads using strain gauges. A fairly good agreement is seen between the analytical and the experimental results.

(Received : February 4, 1999)

Dimensional Stability of Chemically Treated Particleboard

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(Accepted for publication : June 17, 1999)

The dimensional stability of particleboards were evaluated by measurements of water absorption, in-plane linear expansion, and thickness swelling. The effects of pretreatments of particles such as acetylation, formalization, and impregnation of alcohol-soluble phenol-formaldehyde resin or polyethyleneglycol were examined. Post-treatments of boards by acetylation and formalization were also examined. The board prepared from acetylated particles showed an excellent performance as indicated by the values of about 60 to 70% of moisture excluding efficiency, and anti-swelling efficiency on in-plane linear expansion and thickness swelling. Pre-formalization of particles also increased water resistance of the boards. Pre-impregnation of phenolic resin or polyethyleneglycol increased water affinity of the boards, and its dimensional stability was not remarkably improved. Only the boards from pre-impregnated particles of polyethyleneglycol showed an increase in anti-swelling efficiency of 63%. Post-formalization of boards also showed an effective dimensional stability.

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