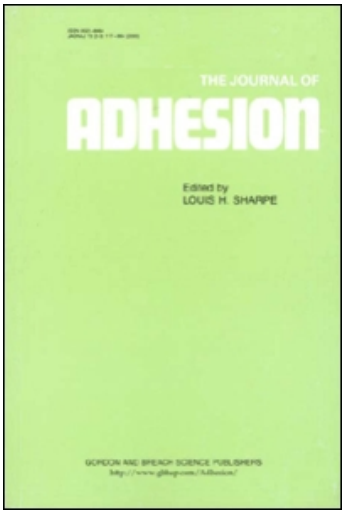

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Contents

An Axi-symmetrical Stress Analysis of Adhesive Butt Joints Having the Disbonded Area and the Spew Fillet (The case where adherends are solid cylinders and joints are subjected to tensile loads)

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Abstract

This paper deals with an axi-symmetrical stress analysis of adhesive butt joints, in which two solid cylinders are jointed, subjected to tensile loads. The analyses were done using the three-dimensional theory of elasticity when joints have a disbonded area at the outer part of interface and a spew fillets. The effect of the disbonded area and the spew fillet on the maximum principal stress distributions were shown by numerical calculations. In the case where a joint has a disbonded area, the stress

singularity increases with a decrease in the diameter of an adhesive. In the case where a joint has a spew fillet, on the contrary, the stress singularity decreases with an increase in the diameter of an adhesive. The analytical result was compared with the experimental result concerning the strain produced on the adherends in the case of the disbonded area. Both results were satisfactorily consistent.

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Internal Stress in Cured Epoxide Resin Coatings

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Abstract

Internal stresses generated in the epoxide resin coatings which were cured by heating and electron-beam (EB) irradiation were determined by using a laser displacement detector.

The internal stress in the heat-cured system was not detected in the curing process, and increased with increasing the shrinkage in glassy region in the cooling process. In this system, the internal stress was independent of the coating thickness. Moreover, the stress was uniformly distributed in the whole of these coatings. It was considered that these are due to the uniformity in the degree of curing and the temperature of these coatings.

Internal stress was hardly observed in the EB-cured system. This is attributed to the following facts: The cooling process was absent in this system, because the temperature of the coatings is scarcely increased by the EB-irradiation, and the shrinkage after vitrification in the curing process is also little, since the curing was not completely progressed.

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Solute Permeability of Composite Membrane Containing Polyvinyl Alcohol and Polyacrylonitrile

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Abstract

Asymmetric composite membranes were prepared through mixing of hydrophilic and hydrophobic polymers.

Crosslinked polyvinyl alcohol was used as hydrophilic polymer. Polyacrylonitrile containing short and polar group (—CN) in side chain was used as hydrophobic polymer.

Ultrafiltration through the membranes containing various mole ratios of hydrophilic and hydrophobic polymers were examined, and permeabilities of water and solutes of molecular weights ranged in 1000 ~ 10000 were studied.

The composite number prepared through mixing of polyvinyl alcohol (5 mole) and polyacrylonitrile (1 mole) was found to have good water permeability and solute permeation selectivity.

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Contents

Electron-Beam Curing of the Mixtures of Epoxide Resin and Tetrahydrofuran

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Abstract

EB curings of bisphenol A diglycidyl ether type epoxy oligomer were carried out using an onium initiator in the presence of THF. Cured products of nearly 100% of final gel contents were obtained from the mixtures containing up to 60 wt% THF. An addition of small amount of THF increased of the gelation rate of epoxide resin due to an increase oligomer chain mobility by dilution with THF. Gel formation measurements and infrared spectral studies clearly show that epoxy oligomer has copolymerized with THF by the EB-irradiation in air. Both the dynamic mechanical and thermogravimetric measurements show that mechanical properties and thermal stabilities of the cured resins containing below 25 wt% THF are almost the same as those of the cured epoxide resins without THF. From the above results THF is concluded to be a useful reactive diluent for radiation curing of bisphenol-A-type expoide resins.

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Surface Analysis of Acrylate Copolymer/Fluoro-copolymer Blends by ATR-FTIR Method

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Abstract

The blend solutions of an acrylate copolymer [Poly (2-ethylhexyl acrylate-co-acrylic acid-co-vinyl acetate)] and a fluoro-copolymer [Poly (vinylidene fluoride-co-hexafluoroacetone)] (in THF, blend concentration ≈20 wt%) were coated on PET film and release liner at 90°C for 60 sec. Then, the blends were laminated with release liner and PET film, respectively. The surface structure of the release liner side for blends were analyzed by ATR-FTIR method, and the absorbance ratio for blends (I_{870}/I_{1730}) were calculated by means of the C-F absorption for fluoro-copolymer at 870 cm^{-1} (I_{870}) and the C=O absorption for acrylate copolymer at 1730 cm^{-1} (I_{1730}). The absorbance ratio (I_{870}/I_{1730}) of release liner side for the blend coated on PET film was much larger than that of release liner side for the blend coated on release liner at the 50 wt% blend of fluoro-copolymer. Therefore, it was confirmed that the acrylate copolymer and the fluoro-copolymer in the blends of fluoro-copolymer component over 50 wt% were enriched on release liner side coated on release liner and PET film, respectively.

(Received: February 25, 1990)

Development of Resins for Vibration-Damping Composite Steel Sheets

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Abstract

Recently, vibration-damping composite steel sheets made from a three layer structure of vibration-damping resin, sandwiched by two layers of steel are required to have high vibration-damping properties for room temperature applications.

Since polyvinyl acetate was known to have good vibration-damping properties at high temperatures (80–100°C), we examined the effects of some copolymer components on the characteristics of vinyl copolymer. VeoVa 10 and n-butyl acrylate improved vibration-damping properties near room temperature. VeoVa 10 had a pronounced effect on the lowering of melt viscosity. Acrylic acid was added to improve adhesion with steel sheets. In addition, the increase of the molecular weight of the resins increased melt viscosity and adhesion strength, but did not appreciably affect vibration-damping properties. The polymerization solvents had considerable effects on the resin characteristics.

The composite steel sheets produced using these resins exhibited a high loss factor of approximately 0.5 at 20–30°C and 250 Hz. The melt viscosity was in the 5–20 Pa · s range at 180°C and adhesion strength was in the 1–2kgf/25 mm range.

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