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

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

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### Moisture Influence on Fracture Behavior of Bonding Layer

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755-1 Ogano, Ogano-machi, Chichibu-gun 368-11, Japan

### Abstract

The bonding properties between insulation resin and conductor are very important in the field of molding of electronic components. The evaluation of moisture influence on bonding layer also is required to use.

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The Adhesion Society of Japan may be contacted at: Koa Nipponbashi 203, 4-2-20, Nipponbashi, Naniwa-ku, Osaka 556, Japan.

In this study, the moisture influences on fracture properties of bonding layer of epoxy resin/aluminum were investigated by performing the water immersion test and PCT (pressure cooker test).

The bonding strength was gradually weakened by the diffusion of water into bonding layer. The logarithmic attenuation on fracture surface of epoxy resin increased with increasing water absorption. The fracture patterns showed a cohesive failure at testing speed below 50mm/min. The bonding strength and elongation of failure also increased as testing speed decreased.

These results indicate the physical properties of bonding layer are influenced significantly by the water immersion test, especially PCT.

(Received: September 30, 1991)

### Water-Resistant Hot-Melt Adhesive for Reinforcement of Optical Fiber Splices

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#### Abstract

Hot-melt adhesive composed of silane-grafted ethylene vinylacetate copolymer with an epoxy group is developed for reinforcement of optical fiber splices. This adhesive applied to quartz glass (peel strength 3–4 kgf/cm) by hot press for 3 minutes at 130°C provides excellent adhesion. The high reactivity of this adhesive results in good storage stability. The storage stability time of the polyethylene packed adhesive film is over 4 years under room conditions. The peel strength is maintained for over one year after immersion in water of 60°C. This high performance hot-melt adhesive is able to improve water-resistance of optical fiber splice parts.

(Received: October 21, 1991)

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**Synthesis and Thermal Properties of Polyimides Consisting of Oligomethyleneanilines**

Katsuya ASAO\*, Takeshi HIROHATA\*, and Hiroyuki NISHIMURA\*\*

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(1-38, Takaida-naka, Higashiosaka, Osaka, Japan.)\*\*Inoac Corporation P. U. Technical Center  
(3-1, Imaike-cho, Anjo, Aichi, Japan)**Abstract**

In order to improve moldability without losing an excellent thermal stability, polyimides were prepared by the reaction of oligomethyleneanilines—which were derived from aniline with formaldehyde—with dimethyl 1-3,3', 4, 4'-benzophenonetetracarboxylate.

The influences of polyimides obtained from oligomethyleneanilines with five different molecular weight on thermal properties and moldability were examined by means of thermomechanical analysis (TMA) and thermogravimetric analysis (TGA). The higher was the Mn of oligomethyleneanilines, the higher was glass transition temperature (Tg) of these polyimides. (The Tg of these polyimides had the temperature range from 264°C to 337°C.)

In spite of the different Mn of oligomethyleneanilines, the thermal degradation temperatures (Td) of these polyimides was almost unchanged. (5% weight loss temperature showed about 500°C in air flow.)

As the difference values Td-Tg of these polyimides were relatively larger than those of general polyimides, it was found that the polyimides prepared from oligomethyleneanilines were easier to mold.

(Received: November 15, 1991)

**An Aqueous Emulsion Adhesive for Dry Lamination of Polyethylene Terephthalate Film and Polyethylene-vinyl Alcohol Film  
Part 1 A Study of Coating Behavior of the Emulsion Adhesive**Makoto TOKIZAWA, Nobukatsu WAKABAYASHI, Shoichi SATOU,  
Ken HOMMA, Akikazu YANO, Hideki WADA and Takashi ABEMitsubishi Kasei Corporation, Research Center  
DIAFOIL Co., LTD, Shiga Operation  
(1,000 Kamoshida-cho, Midori-ku, Yokohama, 227)  
(347 Inokuti Santo-cho, Sakata-gun, Shiga 521-02)**Abstract**

A one component acrylic-epoxy emulsion was investigated to develop the water-borne adhesive for dry lamination of high gas barrier film of polyethylene-vinyl alcohol and high mechanically strong film of polyethylene-terephthalate.

The water-borne coating is generally considered to have disadvantages in coating performance against solvent type coating.

The effects of viscosity, pH, surface tension (contact angle), particle size distribution, MFT, of the emulsion and the coating speed of bar coater were studied to clarify the relation between a small experimental test coating and a continuous line coating of manufacturing from the point of physical properties of the emulsion and the coating conditions.

The emulsion of which has low viscosity, suitable surface tension, and gives a smooth coating appearance in applied with a fast coating speed of the bar was proved to be suitable for the smooth coating in the dry lamination manufacturing.

(Received: November 1, 1991)

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**Effects of Heating Temperature and Time on Hot Melt Adhesion  
between Fluoride Polymers and Metals**

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**Abstract**

It was found that the adhesion between metals and PTFE (polytetrafluoroethylene) sheet was possible with the thermoelastic non-modified fluoropolymer as adhesives, by melt bonding. As adherends, aluminum foil (Al), stainless steel foil (SUS), brass foil (Brass) and PTFE sheet (thickness: 0.1mm etc.) were used. As adhesives, sheets of PFA(perfluoroalkoxyvinylether-tetrafluoroethylene copolymer), FEP (hexafluoroethylene-tetrafluoroethylene copolymer) and ETFE(tetrafluoroethylene-ethylene copolymer) were used. To measure bond strength, two pieces of foil or foil and a sheet were plied inserting an adhesive and a space between them, and this plied up foil (thickness of foil: 40 or 50  $\mu\text{m}$ , width: 20 or 25mm) was bonded with a baby heat press and the bond strength was evaluated by the peel strength of the bonded foils. From the results, it was found that a spacer was essentially necessary for bonding to keep distance between the surface of the adherend greater than the threshold value, and the maximum value existing on the bond strength and strength became stronger with higher heating temperatures (300~350°C) and longer heating time (1~60min). The maximum of strength(Kg/cm) related with the combinations of adherend/adhesive/adherend were: (1.2) Al/PFA/Al, (0.75) Al/FEP/Al, (2.0) SUS/PFA/SUS, (2.5) PTFE/PFA/SUS and etc.

(Received: October 4, 1991)

**Journal of The Adhesion Society of Japan**  
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**Effect of the Packing of Network Chains on the Internal Stress of Epoxy Resin Coatings**

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**Abstract**

Internal stress of the epoxy resin coatings prepared from the resins and the curing agents having different bulkiness in their skeleton structure was measured and were related to the expansion coefficient and the modulus of the cured resins.

The specific volume of the cured resins decreased with a decrease in the bulkiness of the resins and curing agents. Moreover their expansion coefficient and modulus decreased and increased with the decrease of the specific volume, respectively. These results show that these properties depend on the packing density of the cured resins. Internal stress of the coatings was caused from the cooling shrinkage suppressed by the adhesion between the coatings and adherend. Their stresses could be quantitatively estimated by the expansion coefficient and modulus of the coatings in the glassy region.

(Received: April 30, 1992)

**Evaluation of Adhesive Properties on Coating Films in Polypropylene Sheet Surface by Cross-Cut Tape Test**

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### **Abstract**

Adhesive properties on coatings were examined in detail by cross-cut tape test. This study was conducted in the system of polypropylene/coating. A new apparatus was designed for cross-cut test in order to evaluate accurate and reproducible adhesive strength of coating. The surface of polypropylene sheet was activated by plasma treatment, and water paint was spread on it, followed by drying. The effects of cut load and adhesive pressure of pressure-sensitive tape on fraction of amount of coating remained on the surface of PP film per one cm<sup>2</sup> (FCR) were investigated using a tensile tester. We found that the above factors strongly affected the observed FCR. Namely, the FCR abruptly decreased when a value of cut load exceeded a certain value and also with increase of the adhesive pressure.

(Received: November 22, 1991)