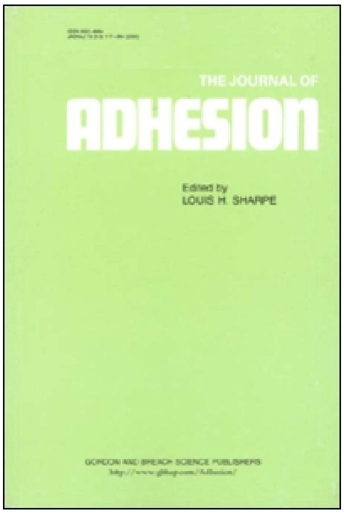

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Vol. 23 No. 8 1987

Contents

Original

Review

Letters of the Editor

UV Curing of Bisphenol A Epoxy Resin —Gel Formation and Changes in Functional Groups by Infrared Spectroscopy—

Toshida OKADA and Tsutomu ASANO
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Abstract

Curing reaction has been carried out on liquid biphenol A epoxy resin using photocationic initiator with UV irradiation in air at room temperature. As a photoinitiator, bis-[-(diphenylsulfonio) phenylsulfide-bis-hexafluorophosphate was mainly used. The chemical changes occurring in the resin system were investigated by infrared spectroscopy and the gel content in the irradiated product was estimated by a conventional extraction method.

The maximum gel content was strongly dependent of the amount of photoinitiator and reached nearly 100% for the system containing photoinitiator of above 5×10^{-2} mol/kg. The results indicate that although the gel content tends to the final maximum value, there still remains in the cured system a certain quantity of epoxide bonds.

The present curing system showed post-cure effects which were proved by observing changes in the infrared absorption band due to the epoxide bond.

(Received: March 3, 1987)

Effect of Corona Treatment on Gluability of Wood
II. Nitrogen Atmosphere

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Abstract

Contact angle, infrared absorbance ratio (1730 cm^{-1}/1500 cm^{-1}), JIS color difference and glue-joint strength of nitrogen corona treated Apitong (*Dipterocarpus grandiflorus* BLANCO) containing 2.5 percent of alcohol-benzene extractives were measured.

The cosine contact angle with distilled water on the wood surface increased with an increase in the nitrogen corona discharging time and it reached a constant. This constant value and initial increment were in proportion to the discharging voltage (4.5–15.0 kV, 60 Hz).

Absorbance ratio did not increase except with long discharging time in 15.0 kV. The color difference increased with an increase in the discharging time and voltage. With 13.5 kV treatment, joint strength glued with phenol resorcinol formaldehyde resin increased with an increase in the time and it reached a maximum. This tendency was the same as that obtained by use of urea formaldehyde resin. The maximum increments of the glue-joint strength were 25–50 percent.

Relationship between the cosine contact angle and the glue-joint strength was analogus to that obtained by air corona treatment. However, cosine contact angle value did not reach unity, and the time to reach a maximum strength was twice that obtained by air corona.

Although the dischargings were carried out in the atmosphere of nitrogen, oxidation occurred. It was considered that the oxygen in air attacked the active site which was activated by the nitrogen corona. These results suggested that ozone oxidation was not a main factor of degradation by the corona treatment.

(Received: April 10, 1987)

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Contents

Original

Review

UV Curing of Bisphenol A Epoxy Resin
-UV Curing of Epoxy Oligomers of Different Molecular Weights-

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Abstract

UV curing behaviors were investigated on bisphenol A epoxy oligomers of different molecular weights using bis-4-(diphenylsulfonio) phenylsulfide-bis-hexafluorophosphate as a photoinitiator by UV irradiation at room temperature. Nearly 100% of final gel contents were obtained in the curing liquid oligomers of different molecular weights. For solid oligomers of molecular weights above 900 the final levelling-off gel content decreased with the increase of their molecular weights. Approximately one third of the amount of the cured product remains as soluble part in the irradiation of the oligomer of molecular weights 5500.

Infrared spectroscopic data exhibited that after the gel content of each oligomer attained its final levelling-off value, a certain amount of epoxide groups still remained in its network structure.

(Received: March 18, 1987)

Effect of the Network Structures on the Internal Stress of Cured Epoxide Resins

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Abstract

Effect of the network structures on the internal stress of cured epoxide resins was investigated. Thus, it was found that the biphenyl-type resin-system, which has no carbon atom between the aromatic rings in the back-bone of epoxide resin, has lower internal stress than that of other systems. It was also shown that this cured system has high glass transition temperature and high modulus is the rubbery region, and hence has low network-chain mobility. These results show that the reduction of the internal stress and the improvement of the heat resistance are simultaneously caused by the introduction of biphenyl-type structure to the epoxide resin networks.

However, the modulus in the glassy region of the biphenyl-type resin system was lower than that of other systems, we consider that this system is shifted to the glassy state due to the situation that the system has relatively large free volume, because the conformational rearrangement of networks is hindered by the low mobility of the network chains, and hence shows low modulus in the glassy region. It is concluded from this result that the low internal stress of the biphenyl-type resin is attributed to the low glassy modulus of this system.

(Received: March 26, 1987)