

# Studies on Curing Process of Epoxy Resins by Py-GC

## - Cured with Hexahydrophthalic Acid Anhydride (HHPA) -

**[Background]** Curing process of epoxy resins has been often studied by IR, FT-IR, or NMR by looking at the spectral changes of chemical species formed during the course of curing process. DSC has also been used to study the curing reactions by evaluating the heat of reaction. On the other hand, high resolution Py-GC is another technique that can be applied for studying systems with insoluble species and various additives.

**[Experimental]** A pyrolyzer with a vertical micro-furnace was directly attached to a GC equipped with a high resolution capillary column (0.2 mm id, 24m long) coated with methyl phenylsilicone. Diglycidyl ether of bis-phenol A (DGEBA, Mn≈340) prepolymer and HHPA cured at 100°C for various cure-times were analyzed by Py-GC at 590°C.

**[Results]** Figure 1 shows typical pyrograms of DGEBA cured with HHPA at 100°C for various cure-times. Relationships between the peak intensities of pyrolyzates and cure-time are shown in Figure 2. It was observed that the yields of the pyrolyzates with epoxide groups decreased with increase of the degree of cure, while those of various phenols, characteristic of prepolymer skeleton increased. The results observed corresponded well to the those deduced from Tg measurements by DSC.

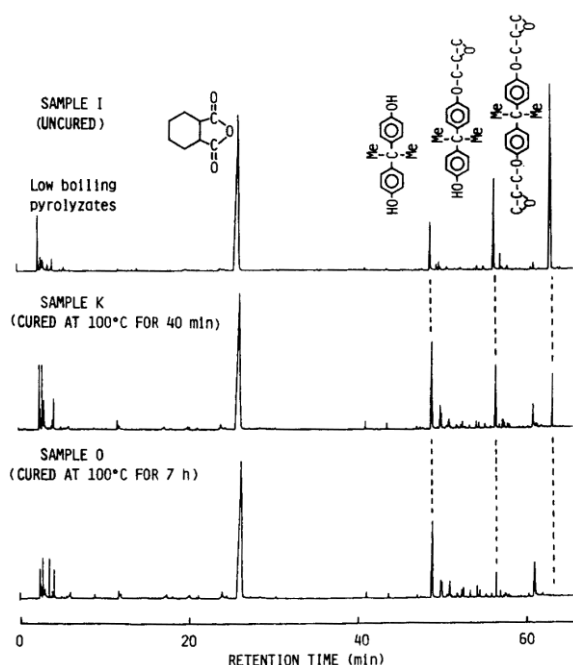


Figure 1. High-resolution pyrograms of epoxy resins cured with HHPA at 100°C for various cure-time

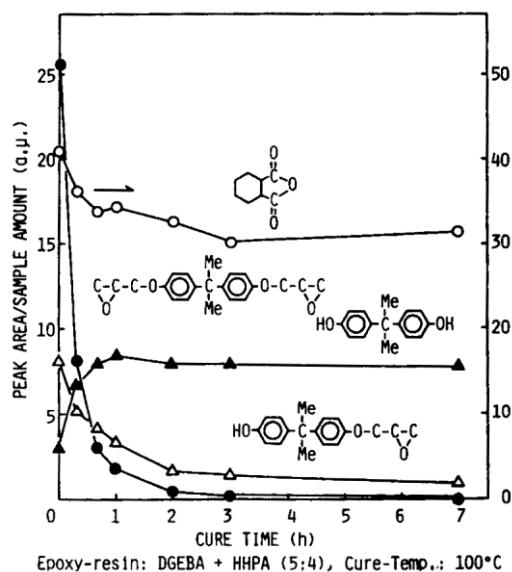


Figure 2. Changes of characteristic products from epoxy resin as a function of cure-time

\*Contents excerpted from H. Nakagawa, S. Wakatsuka, S. Tsuge, T. Koyama, *Polymer J.*, 20 (1988) 9-16.

**Keywords :** Py-GC, Epoxy Resin, Curing Process

**Products used :** Multi-functional pyrolyzer

**Applications :** General polymer analysis

**Related technical notes :**

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