

Reactive Monomers Derived from *p*-Vinylbenzoic AcidBy Yoshio IWAKURA, Keikichi UNO, Nobuo NAKABAYASHI  
and Takakazu KOJIMA

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The preparation and the application of reactive polymers have been studied in our laboratory.<sup>1,2)</sup> Generally, reactive polymers can be obtained by the polymerization of so-called reactive monomers, which have a carbon-carbon double bond, and another functional group, such as epoxide, aziridine or isocyanate.

The present paper will describe the preparation of new reactive monomers derived from *p*-vinylbenzoic acid.<sup>3,4)</sup> Jäger's method was adopted for preparing the acid in this report.

**Glycidyl *p*-Vinylbenzoate.**—*p*-β-Bromoethylbenzoic acid (I) was prepared by the procedure of Foreman.<sup>5)</sup> I was treated with potassium hydroxide in ethanol in order to obtain potassium *p*-vinylbenzoate (II). The reaction of II and epichlorohydrin using triethylbenzylammonium chloride as a catalyst produced glycidyl *p*-vinylbenzoate (III), which was then distilled at 115.5–116.5°C/0.1 mmHg. The yield was 71%.

Found: C, 70.63; H, 6.01. Calcd. for C<sub>12</sub>H<sub>12</sub>O<sub>3</sub>: C, 70.57; H, 5.92%.

The infrared absorption spectrum showed carbon-carbon double-bond bands at 1629, 987 and 918 cm<sup>-1</sup>, epoxide at 907 and 839 cm<sup>-1</sup>, carbonyl at 1720 cm<sup>-1</sup> and *p*-phenylene at 856 cm<sup>-1</sup>. The epoxide content was 98.0%.

When the radical polymerization of III was carried out, linear poly-III was obtained; it had a  $\eta_{sp}/c$  value of 0.20 (0.2 g./100 ml. dioxane at 30.0°C), and the epoxide content of the polymer was 96.0%. The copolymerization of III (M<sub>2</sub>) with styrene (M<sub>1</sub>) was also studied. The monomer reactivity ratios were as follows:  $r_1 = 0.40 \pm 0.02$ , and  $r_2 = 0.95 \pm 0.10$  (at 70.0 ± 0.1°C). Alfrey-Price's  $Q$  and  $e$  values were 1.18 and 0.18 respectively. Nucleophilic reagents such as hydrogenchloride and alkyl amine, could easily be added to epoxy groups in the poly-III and the copolymer.

***p*-Vinylphenylisocyanate.**—This compound<sup>6)</sup> (b. p. 40.5–41.5°C/0.1 mmHg) was obtained through the acid chloride and the acid azide. The isocyanate gave a homopolymer with a vinyl group by means of the anionic polymerization of the isocyanate group at a low temperature. The radical polymerization, on the other hand, brought about one with a isocyanate group.

The details will be published in a short time.

Department of Synthetic Chemistry  
Faculty of Engineering  
The University of Tokyo  
Hongo, Tokyo  
(Y. I., K. U. & T. K.)

Research Institute of Dental Materials  
Tokyo Medical and Dental University  
Yushima, Bunkyo-ku  
Tokyo (N. N.)

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