

Fischer yielded the corresponding aldo-octose sugars. The D-gluco-L-gala-octose was crystallized by him, but not the epimeric octose. We have now crystallized this D-gluco-L-talo-octose; it is anhydrous, melts at 117–118° (cor.) and mutarotates in water from an initial  $[\alpha]^{20}_D$  of about  $-32^\circ$  to the equilibrium rotation of  $-6.5^\circ$ . The direction of this change leads to the naming of the crystalline sugar as a  $\beta$ -D-form. Since its reducing end possesses the L-talose configuration, it is to be expected that its properties will be similar to those of  $\alpha$ -L-talose because this  $\beta$ -D-octose form is analogous to an  $\alpha$ -talose form.<sup>3</sup> Isbell and Pigman<sup>4</sup> have found that the mutarotations of  $\alpha$ - and  $\beta$ -D-talose are different in character; both show complex mutarotation, but the unimolecular coefficient values for the  $\alpha$ -form decrease during the progress of the reaction whereas those for the  $\beta$ -form increase. Naturally, the same properties of rate apply for  $\alpha$ - and  $\beta$ -L-talose. In agreement with expectations, the mutarotation of  $\beta$ -D-gluco-L-talo-octose is complex in character and the unimolecular coefficient values decrease during the reaction. The osazone of the octose proves to be identical with that from D-gluco-L-gala-octose, as is to be expected. The benzimidazole from D-gluco-L-gala-octonic acid is found to rotate to the left ( $[\alpha]^{20}_D -44.7^\circ$  in 0.1 N HCl) and that from D-gluco-L-talo-octonic acid to the right ( $+18.6^\circ$ ); these directions of rotation confirm, by the benzimidazole rule,<sup>5</sup> the configurations which have been inferred previously<sup>6</sup> for these octonic acids from the application of the lactone, the amide and the phenylhydrazide rules of rotation. The reduction of the two octoses with hydrogen and Raney nickel yields, respectively, D-gluco-L-gala-octitol (m. p. 153–154°,  $[\alpha]^{20}_D +2.4^\circ$  in water; octaacetate, m. p. 141,  $[\alpha]^{20}_D +20.7^\circ$  in chloroform) and D-gluco-L-talo-octitol (m. p. 161°,  $[\alpha]^{20}_D -0.8^\circ$  in water; octaacetate, m. p. 102°,  $[\alpha]^{20}_D +17.4$  in chloroform).<sup>7</sup> The first of these readily distinguishable octitols has a configuration which is identical with that of one of the two octitols that can be expected in the

(3) If one finds the designation of the octose as a  $\beta$ -D-form confusing, the sugar can be named D-gluco- $\alpha$ -L-talo-octose with equal propriety. Either designation follows the accepted rules of nomenclature.

(4) Isbell and Pigman, *J. Res. Natl. Bureau of Standards*, **19**, 189 (1937).

(5) Richtmyer and Hudson, *This Journal*, **64**, 1612 (1942).

(6) Hudson, *ibid.*, **39**, 462 (1917); Hockett and Hudson, *ibid.*, **60**, 622 (1938).

(7) We thank Dr. W. D. Maclay for permission to quote these data from a forthcoming publication.

series of higher carbon sugars from D-galactose, namely, D-gala-L-gulo-octitol; its synthesis in that series is being sought in order to obtain conclusive proof of configurations in the glucose and galactose series of higher carbon sugars.

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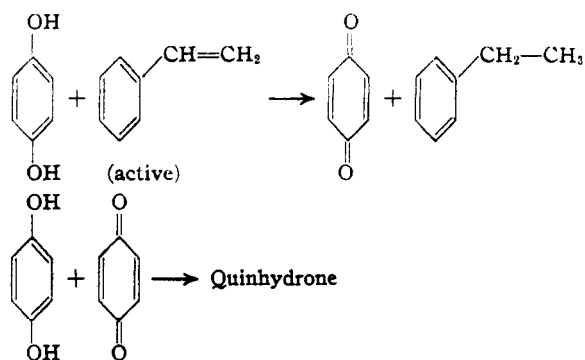
RECEIVED APRIL 3, 1943

#### FORMATION OF BIRADICALS IN THE NON-CATALYZED POLYMERIZATION OF STYRENE

Sir:

In studying the effect of inhibitors upon the kinetics of styrene polymerization, it seemed to us that appearance of the hydrogen of hydroquinone in the reaction product is indicative of the nature of the active nucleus.

The reaction yields quinone, quinhydrone and ethylbenzene, probably according to the scheme



Preliminary experiments were made in the following manner. Equimolecular amounts of hydroquinone and styrene were sealed in test-tubes and submitted to temperatures of about 150° for forty-eight to seventy-two hours, whereupon the solution turned dark brown. Refractive index measurements of the product obtained after elimination of the remaining hydroquinone by extraction with dilute sodium hydroxide and fractionated distillation of the residue (about 138°) gave the following results:

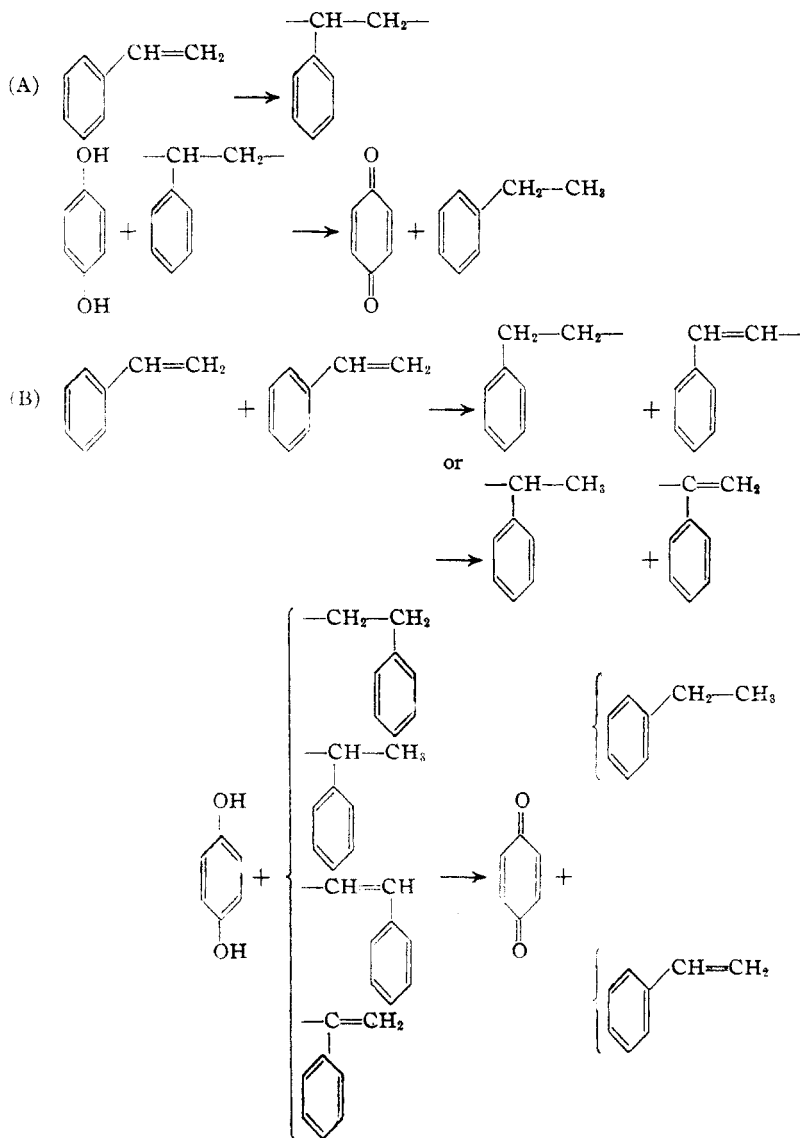
	Refractive index	Difference of refractive indices
Ethylbenzene	1.4959	0.0000
Fract. 1	1.4960	.0001
Product	1.4967	.0008
Fract. 2	1.4975	.0016
Styrene	1.5449	.0490

Although the experimental technique has not yet been developed to yield quantitative results as far as the rate process goes, the analytic results so far obtained seem to show the presence of

ethylbenzene and allow certain conclusions as to the nature of the active nucleus.

Ethylbenzene can be obtained according to the following mechanisms:

about 24,000 cal. per mole. We believe, therefore, that at sufficiently high temperatures mono- or bimolecular thermal activation according to (A) does take place.



Mechanism (B) seems to be improbable, because its activation energy would presumably be considerably larger than the observed value of

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RECEIVED FEBRUARY 10, 1943