washed with dilute alkali, dried, and fractionated. The residue was distilled in a small sausage flask and yielded 2.53 g. of the methylterphenyl which melted at 91–92° after recrystallization from methanol.[7]

Anal. Calcd. for $C_{19}H_{16}$: C, 93.34; H, 6.60. Found: C, 92.97; H, 6.58.

Terphenyl.—A sample (1.46 g.) of *p*-biphenylcyclohexene, 3.3 g. of chloranil and 18 cc. of dry xylene were refluxed and the reaction worked up as described in the preceding section; yield of terphenyl 0.63 g. The product melted at 210–211.5°. The identity of the substance was checked by preparing the nitro derivative; melting point 275°.[7]

α-Phenylnaphthalene.—Five grams of α-naphthylcyclohexene prepared as described in the literature[8] was refluxed with 11.8 g. of chloranil in 20 cc. of xylene for five hours. The reaction mixture was cooled, diluted with an equal volume of petroleum ether (30–60°) and filtered, yielding 8.4 g. of chloranil hydroquinone. The remainder was removed by basic extraction. The resulting fractionation yielded 3.33 g. of α-phenylnaphthalene. The structure was checked by the formation of its nitro derivative which melted at 129–130°. The literature reports 132°.[8]

β-Phenylnaphthalene.[5]—Following the same procedure as given above, β-naphthylcyclohexene was dehydrogenated to give β-phenylnaphthalene in a yield of 72%. The constitution of this molecule was proved by direct oxidation to β-phenyl 1,4-naphthoquinone; melting point 108–109°.[9]

2-Methylbiphenyl.—This substance was obtained by refluxing a solution containing 12 g. of *o*-tolylcyclohexene, 36 g. of chloranil, and 115 cc. of xylene. The yield of pure product obtained by fractionation was 8.5 g. (72.6%).[3]

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(8) Weiss and Waidich, *Monatsh.*, **46**, 456 (1925).

(9) Chattaway and Lewis, *J. Chem. Soc.*, **65**, 873 (1894).

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Catalytic Action of 8-Hydroxyquinoline on the Oxidation of *p*-Phenylenediamine

BY FREDERICK BERNHEIM AND PHILIP HANDLER[1]

8-Hydroxyquinoline can, under certain conditions, catalyze the oxidation of cysteine to cystine.[2] It has now been shown that it has a catalytic effect on the oxidation of *p*-phenylenediamine and certain related substances. Figure 1 shows this effect on *p*-phenylenediamine recrystallized from water and from alcohol. The oxygen uptake was measured at 37° in the Warburg apparatus. Successive recrystallizations of the diamine have no effect on the catalysis, showing that the 8-hydroxyquinoline is not simply removing an antioxidant. Addition of metal ions such as the cupric, ferric and vanadate does not enhance the catalytic effect which is, therefore, probably not due to a metal-8-hydroxyquinoline complex. The catalysis is not affected by 0.02 *M* cyanide or pyrophosphate. It has an optimum *p*H at about 6.5 and the rate falls off rapidly in alkaline solutions. The oxidation product is deeply colored, which is characteristic of the polymer of the quinone diamine and which can be reduced by hydrosulfite. On isolation and hydrolysis with acid it gives free ammonia. From the oxygen uptake figures a small percentage of further oxidation products must be formed which have not been isolated.

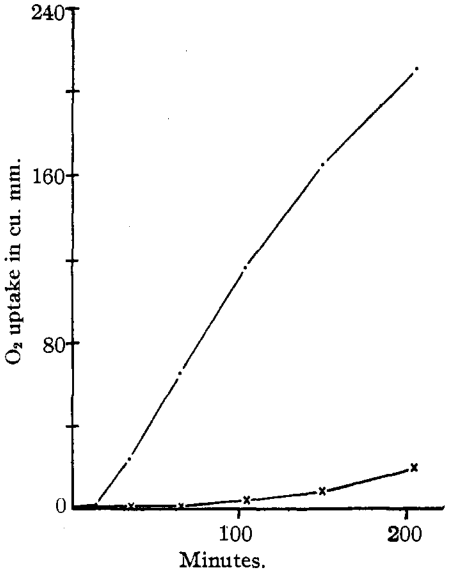

Fig. 1.—The oxygen uptake of 3.0 mg. of *p*-phenylenediamine in 2.0 cc. of water at *p*H 6.7: ×—×, control; ·—·, with 0.05 mg. of 8-hydroxyquinoline. The short latent period is characteristic.

8-Hydroxyquinoline has no effect on the oxidation of *o*-phenylenediamine, catechol or hydroquinone in acid or alkaline solutions. It has a comparatively small effect on the oxidation of *p*- and *o*-aminophenols in alkaline solutions (*p*H 7.8). 2-Hydroxyquinoline and certain other quinoline derivatives are without catalytic action.

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(2) F. Bernheim and M. L. C. Bernheim, "Symposia on Quantitative Biology," Vol. VII, 1939, in press.

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The Mechanism of Plant Respiration

BY HAROLD HIBBERT

The discovery (see following note) in the ethanolysis products from spruce wood of methyl guaiacyl diketone alongside the previously re-