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REARRANGEMENT DURING REDUCTION OF CIS- AND TRANS-2-PHENYLCINNAMIC ACIDS WITH LITHIUM ALUMINIUM HYDRIDE

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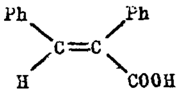
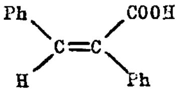
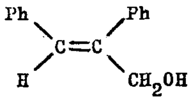
REDUCTION of *cis*- and *trans*-2-phenylcinnamic acids, (I) and (II) respectively,[1] with lithium aluminium hydride was expected to give either the saturated alcohol,[2] 2,3-diphenylpropanol (III) or the unsaturated alcohols,[3] *cis*-2,3-diphenylallyl alcohol (IV) from (I)

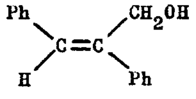

(I)


(II)

$PhCH_2.CHPh.CH_2OH$

(III)


(IV)


(V)

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[1] L.F. Fieser, Experiments in Organic Chemistry, 3rd Edition, D.C. Heath & Co., Boston, U.S.A. p. 182 (1955).

[2] Cf. R.F. Nystrom and W.G. Brown, J. Amer. Chem. Soc. 69, 2548 (1947).

[3] Cf. Li Liang and W.H. Elliott, J. Amer. Chem. Soc. 74, 4089 (1952).

or *trans*-2,3-diphenylallyl alcohol (V) from (II) or a mixture[4] of (III) and (IV) or (V).

Treatment of either *cis*-2-phenylcinnamic acid (I), m.p. 174° or *trans*-2-phenylcinnamic acid (II), m.p. 137° with excess of lithium aluminium hydride in refluxing ether (4 hours) gave needles (90% from light petroleum, b.p. 40-60°), m.p. 66-67° (Found: C, 85.6; H, 6.7. $C_{15}H_{14}O$ requires C, 85.7; H, 6.7%). This product has been shown by the following evidence to be 1,2-diphenylallyl alcohol (VI). In ethanol

$$\mathrm{PhCH(OH).CPh{=}CH_2} \qquad\qquad \mathrm{PhCH(OH).CHPh.CH_3}$$

(VI) (VII)

the compound has λ_{max} 257mμ (log ε 4.09) typical of a styrene[5] but not of a stilbene system.[6] Ozonolysis gave benzil in 94% yield. Hydrogenation over Adams catalyst at room temperature and atmospheric pressure gave 1,2-diphenylpropanol (VII), characterised as its phenylurethane, m.p. 115-116°.[7]

1,2-Diphenylallyl alcohol (VI) was recovered after treatment with acetic anhydride for several hours followed by hydrolysis with ethanolic potassium hydroxide, conditions which normally cause anionotropic rearrangement of 1-phenylallyl alcohols.[8] This result indicates that (VI) is thermodynamically more stable than either (IV) or (V), possibly a result of steric inhibition of resonance in the uniplanar conformations of (IV) and (V).[9]

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[4] Cf. F. Weygand and D. Tietjen, *Chem. Ber.* **84**, 625 (1951).

[5] R.A. Morton and A.L. Stubbs, *J. Chem. Soc.* 1347 (1940).

[6] E.A. Braude, *J. Chem. Soc.* 1902 (1949).

[7] F. Kayser, *Ann. Chim. (France)* **6**, 145 (1936).

[8] H. Burton and C.K. Ingold, *J. Chem. Soc.* 904 (1928).

[9] Cf. E.A. Braude and P.H. Gore, *J. Chem. Soc.* 41 (1959).