TABLE V

ELECTRIC MOMENTS OF CHLORIDES AND NITRILES

Compound	10^{18} μ	Compound	10^{18} μ
Chlorobutane	2.04	Valeronitrile	3.57
Chlorobenzene[6]	1.56	Benzonitrile[6]	3.91
Butylchloroacetylene[7]	1.23	Butylpropiolnitrile	4.21
Phenylchloroacetylene[8]	1.10	Phenylpropiolnitrile	4.50

Discussion

The large moments found for the acetylenic nitriles reveal the existence of resonance in these compounds as well as in the halogenoacetylenes. From Table V it can be seen that butylchloroacetylene has a lower moment than chlorobenzene, while butylpropiolnitrile has a higher moment than benzonitrile. These comparisons indicate that the forms $R—C^-{=}C{=}Cl^+$ and $R—C^+{=}C{=}C{=}N^-$ contribute to a greater extent to their respective molecules than do the forms $^-C_6H_5{=}Cl^+$ and $^+C_6H_5{=}C{=}N^-$. The electromeric polarizability of the acetylene triple bond is therefore greater than that of the phenyl group. A pronounced increase in moment is obtained by replacing a phenyl group for an alkyl group in the acetylenic nitriles despite the fact that the alkylacetylenes have higher moments than phenylacetylene. While this increase is due partly to the fact that the form $^+C_6H_5{=}C{=}C{=}C{=}N^-$ is more polar than $R—C^+{=}C{=}C{=}N^-$ it is also evidence of the strong resonance in phenylpropiolnitrile.

Summary

1. Electric moments have been determined for butyl-, amyl-, phenyl- and *p*-tolylpropiolnitriles.
2. The values obtained for these moments prove the existence of resonance in these molecules as well as in the alkyl and aryl halogenoacetylenes.
3. The electromeric polarizability of the acetylene triple bond is shown to be greater than that of the phenyl group.

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[6] Smyth, "Dielectric Constant and Molecular Structure," A. C. S. Monograph, 1931, 203.

[7] Pflaum and Wenzke, THIS JOURNAL, **56**, 1106 (1934).

[8] Wilson and Wenzke, *ibid.*, **56**, 2024 (1934).

NOTES

Photosynthesis and the Absorption of Radiation by Plants

BY G. RICHARD BURNS

In the course of investigations on the amount of photosynthesis by white pine seedlings in different portions of the spectrum, a rather interesting correlation was found between the amount of photosynthesis and the color of the plant.

In an attempt to arrive at some value for the radiation absorbed by the plant the reflection of the plant was assumed to be the reflection of the needles to light of 45° incidence and the absorption, the absorption of the plant pigments in acetone solution with the concentration the same as in the plant. The absorption spectrum obtained from these two values might be called the "primary absorption spectrum" of the plant, defining the difference between this and the true absorption as the "secondary absorption." The values for the secondary absorption would be high where the primary is low due to reflection within the needle. Also the absorption of the pigments is shifted toward the blue when in solution. In determining the absorption and reflection values, each spectrometer reading covered a wide band of wave lengths and the front slit was 0.75 mm. wide so that the spectrum was rather blurred.

Graph I gives the percentage primary absorption for two types of seedlings, B for those grown in blue light and R for those grown in red. The stepwise curves indicate, approximately, the range of wave lengths covered at each reading. Assuming constant quantum efficiency and that only light thus primarily absorbed is effective in photosynthesis it is possible to calculate the relative amounts of photosynthesis in any two portions of the spectrum. These values calculated from the rough physical measurements agree within a few per cent. with the experimentally determined values in all cases. Thus these primary absorption curves may be considered as representing the relative amounts of photosynthesis at equal incident quantum intensity.

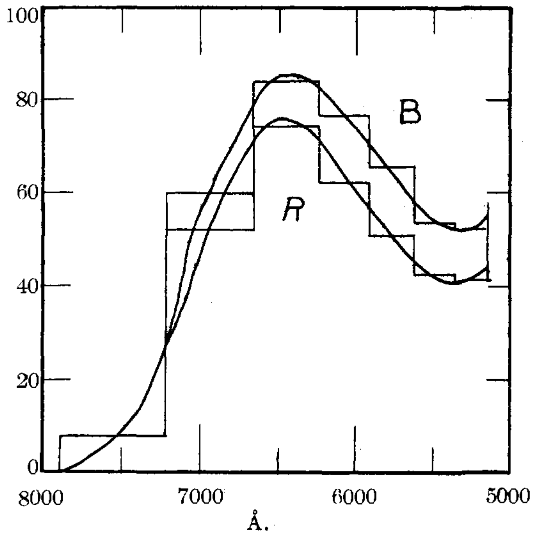

Fig. 1.

The fact that the amount of photosynthesis depends on the primary absorption spectrum seems fairly well established since the relationship holds for a large number of experiments with different ranges of wave lengths and different colors of trees as well as with experiments with semi-monochromatic radiation from filtered sodium and mercury sources. It offers a quantitative explanation of all our experimental results, published in botanical journals from 1933 on. Just why the amount of photosynthesis should agree with this arbitrary value rather than with the true absorption is still a matter of speculation.

Vermont Agricultural Experiment Station
Burlington, Vermont

Hunter College
New York City

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Diazo Coupling of 5-Hydroxy-6-methylhydrindene

By Louis F. Fieser and Warren C. Lothrop

In a previous report [This Journal, **58**, 2050 (1936)] we stated that the above compound (I) failed to couple with diazotized *p*-nitroaniline in alkaline solution, whereas in parallel tests 5-hydroxy-4,7-dimethylhydrindene and 6-hydroxy-5,8-dimethyltetralin coupled readily under the same conditions. On preparing a further quantity of I in order to investigate its behavior with other coupling agents, we first tried to effect a coupling with diazotized *p*-nitroaniline under other conditions and found that this indeed can be accomplished. Each of seven solutions containing 0.1 g. of I in 10.5- to 20-cc. portions of sodium hydroxide solutions of concentrations varying from 0.119 to 2.49 *N* was treated at 0° with 2.5 cc. of an aqueous solution containing approximately one equivalent of the diazo compound and 0.000021 mole of hydrochloric acid, and after ten minutes the mixtures were boiled and the precipitate collected. The crude *p*-nitrobenzeneazo derivative of I (m. p. 210–215°) was obtained in yields decreasing steadily from 36% in the most weakly alkaline medium to a negligible amount (*ca.* 1%) in the most alkaline solution. The purified azo compound formed brown-red needles, m. p. 230–232° (calcd.: C, 64.63; H, 5.08. Found: C, 64.32; H, 5.34). Similar results were obtained even with aniline, the benzeneazo compound forming red needles, m. p. 141–143° (calcd.: C, 76.16; H, 6.39. Found: C, 75.97; H, 6.60).

We are investigating the conditions of the couplings more fully and making a further comparison with related compounds; but it seems desirable to correct at once the impression given in the earlier report that the hydrindene derivative I departs entirely from the behavior characteristic of a phenol having a free ortho position.

Converse Memorial Laboratory
Harvard University
Cambridge, Massachusetts

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Allomucic Acid

By Fred L. Humoller and Wm. F. McManus

Recently we published a paper on the preparation of new derivatives of *l*-allonic and *l*-altronic acids. While we were mainly concerned in this paper with the interesting behavior of allonic acid and its lactones, we also described briefly several new compounds related to the above two acids, among them allomucic acid. Dr. Th. Posternak has been kind enough to point out to us that in 1935 he had published an account of the preparation of allomucic acid from *d*-allonolactone. Unfortunately we had over-