

former rather than in the latter, although the equivalent time interval is only  $c. \frac{1}{20}$  second. The effect no longer appears if a plug of oxidised copper is inserted between the discharge tube and the first trap, and addition of large excess of oxygen to the glowing gas at the same point also enables the same amount of nitrogen dioxide to be collected in either vessel. It would appear that active nitrogen—which is very susceptible to catalytic destruction by copper oxide or oxygen—is formed simultaneously with the nitric oxide, and decomposes a good deal of it unless a suitable third body is present. The effect diminishes as the percentage of oxygen increases, as is to be expected.

The marked superiority of the impulse discharge already reported for the production of active nitrogen<sup>1</sup> has also been observed for this reaction and for the dissociation of oxygen. In the latter case, however, the yield of atomic species increases very considerably with the frequency, although the power input is held constant, an effect which may possibly be connected with the enhanced yields of ozone observed at 1,000 cycles as compared with commercial frequencies.

A full account of these experiments will shortly be published.

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<sup>1</sup> *Proc. Roy. Soc., A*, 152, 158 (1935).

### Change in Optical Rotation of Glucose in Dilute Solutions of Boric Acid

SOME unexpected results obtained on the respiration of a strain of yeast in boric acid buffers<sup>1</sup> led us to investigate the changes in *pH* and in the optical rotation of glucose in boric acid and in borax solutions. In spite of the claim to the contrary<sup>2</sup>, we observed a change in the optical rotation of glucose in boric acid solutions at certain concentrations. The table below and Fig. 1 show the changes in *pH* values and in  $[\alpha]_D$  of glucose when different amounts of boric acid ( $H_3BO_3$ ) or borax ( $Na_2B_4O_7$ ) are added to solutions containing 10 per cent (5.55*M*) glucose. The solutions were prepared 24 hours prior to observation.

$H_3BO_3$ experiments				$Na_2B_4O_7$ experiments			
Conc. of $H_3BO_3$	[Glucose] $[H_3BO_3]$	<i>pH</i>	$[\alpha]_D$	Conc. of $Na_2B_4O_7$	[Glucose] $[Na_2B_4O_7]$	<i>pH</i>	$[\alpha]_D$
0	0	—	52.5	0	0	—	52.5
<i>M</i> /10	55.5	4.14	51.8	<i>M</i> /15	33.1	6.88	46.9
<i>M</i> /7.5	41.7	4.06	46.6	<i>M</i> /12.5	69.5	6.88	41.9
<i>M</i> /5	27.8	3.90	48.0	<i>M</i> /10	55.5	6.93	38.7
<i>M</i> /2	11.1	3.59	50.3	<i>M</i> /7.5	41.7	6.98	36.1
				<i>M</i> /5	27.8	7.14	33.8

Two facts stand out in these results: While the changes in *pH* in both the boric acid and the borax solutions and the change in  $[\alpha]_D$  of glucose in borax solution may be represented by smooth curves, the change in  $[\alpha]_D$  of glucose in boric acid solution is not a smooth curve. The total change in  $[\alpha]_D$  is of the order of 20° in the borax series, while the maximum change in  $[\alpha]_D$  in boric acid solutions

amounted to only about 6°. Using a 10 per cent sugar solution and a tube length of 20 cm., a change of 6° in the specific rotation amounted to only about 1° in the rotation actually observed.

The data for the boric acid series is presented graphically in Fig. 1, the upper part of which gives the data for *pH* and the lower part,  $[\alpha]_D$ , all plotted against the common abscissa, which is the concentration of boric acid. The line separating the two curves gives the specific optical rotation of a pure glucose solution. We see that the value of  $[\alpha]_D$  of glucose in an *M*/10 boric acid solution is about the same as that for a pure glucose solution, dropping suddenly to a sharp minimum at *M*/7.5 boric acid; it then rises gradually to about the same value as that for pure glucose as the concentration of boric acid is further increased. The (molar) ratio of the concentration of glucose to that of boric acid at the point where the minimum occurs is 42 : 1.

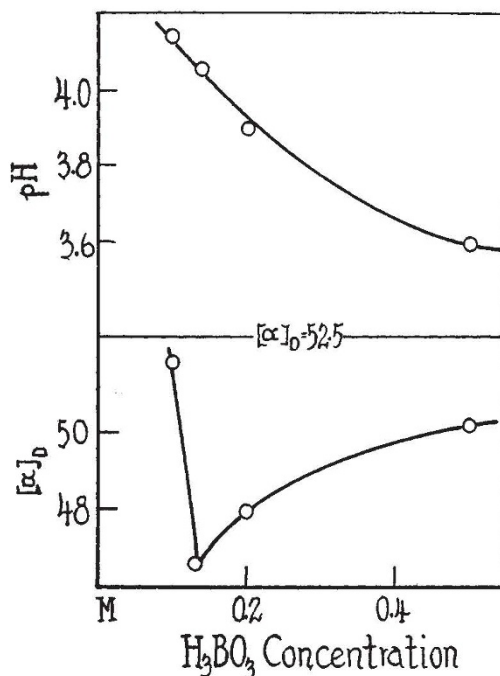


FIG. 1.

This sudden change in the angle of rotation of glucose in a limited range of boric acid concentration accounts for the conclusion of Darmois and others<sup>2</sup> to the effect that even at saturation, boric acid does not change the optical rotation of glucose, though the speed of mutarotation is accelerated by the presence of boric acid.

Detailed experiments on the complex formation between glucose and boric acid is being planned in collaboration with the Department of Chemistry of this University.

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<sup>1</sup> Tang, MS. sent to the *J. Cell. Comp. Physiol.* (1935). Tang and Lin, MS. sent to *Science* (1935).

<sup>2</sup> Darmois and Peyroux, *C.R. Acad. Sci.*, 193, 1182 (1931); and citations given by these workers.