Critical Voltage for the Formation of Ozone by the AlternatingCurrent Discharge

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Critical Voltage for the Formation of Ozone by the Alternating-Current Discharge

In a study of the oxygen-ozone equilibrium condition with the same type of apparatus that was used in the study of active hydrogen,[1] it was found that the yield of ozone increased regularly with the voltage up to 75 volts on the primary. At this voltage the discharge was a faint bluish glow. Upon attempting to increase the voltage the discharge changed to a greenish-yellow glow. This was accompanied by a drop in voltage and an increase in amperage and wattage. The yield of ozone decreased and finally reached zero.

The gas stream was diverted from the potassium iodide absorption flask until the glowing discharge was well established, then the oxygen-ozone mixture was passed through the absorption flask for half an hour without producing a trace of free iodine. In Table I is a typical series of 15-minute runs at 1.5 liters per hour and at 25 mm pressure.

In run No. 7 the greenish-yellow glow appeared in the discharge 8 mm after the beginning of the run. In runs No. 9 and 10 the glow was present throughout the duration of the run.

The spectrograph showed the greenish-yellow glow to be composed of continuous spectrum in the red, yellow and green while oxygen bands appeared in the discharge proper. It would seem that conditions in the discharge should be just as favorable for producing ozone after the greenish-yellow glow appears as before when there is but a slight bluish glow around the electrodes.

TABLE I.

No.	Primary wattage	Primary voltage	Primary amperage	Percent of ozone by weight
1	7.5	45	1.4	0.76
2	10	50	1.6	0.94
3	11.2	55	1.8	1.06
4	13.7	60	2.	1.24
5	15.8	65	2.1	1.32
6	18	70	2.3	1.50
7	20	75	2.5	1.67
8	20	75 Glow appeared	2.5	0.90
9	35	65	3	.00
10	60	60	3.3	.00

For each fixed velocity and pressure there is a critical discharge voltage at which the greenish-yellow glow appears and ozone ceases to be formed. This problem is being investigated further.

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[1] A. C. Grubb and A. B. Van Cleave, *Active Hydrogen*, J. Chem. Phys. **3**, 139 (1935).