THE THEORY OF CHEMICAL ACTION
IN ELECTRICAL DISCHARGE

That slow chemical action accompanies various
types of electrical discharge in many gases has been
long known. Berthelot\(^2\) summarized and reviewed
the earlier as well as his own work, in which the arc,
spark or silent discharges were applied to a large num-
ber of gases or gaseous mixtures. At that time little
or no attempt was made to find a general mechanism
or theory. This is not surprising if we remember that
almost nothing of our present ideas of discharge in
gases was then known. While some of the early re-
results have not been confirmed by later work, most of
them have been, and many of the unusual products
have also been found in other ways, for example, under
alpha radiation, proving that the early work of
Berthelot, Thenard, Brodie and their contemporaries
offers many valuable leads and forms a basis for fur-
ther progress.

Naturally the first attempts to find a theory for
the electrochemical effects in gases were directed
toward a correlation between the current flowing and
the amount of action produced according to Faraday's
law. The disagreement found in the exhaustive re-
searches of Warburg and of others, while unexpected,
was so unmistakable that these efforts had to be aban-
doncd.

The theories advanced since then attribute the effects
to one of the following agencies: (1) Photochemical;
(2) Static ions; (3) Critical activation by kinetic ions.
Upon failing to find a relation between current and
chemical effect, Warburg quite early adopted the idea
that ozone formation, for example, might be due to the
ultra-violet light accompanying the discharge. In his
review\(^3\) of the subject in 1925 he still adhered to this
hypothesis.

The equality of ozonization and ionization of oxy-
gen by means of Tesla discharge convinced Krüger
in 1912 of a static-ion theory of ozone formation.
Simultaneously a study of ozonization under a radia-
tion led me to the same conclusion, and to a general-
ization of this theory (as also Krüger) to explain all

\(^1\) The presidential address, presented at the fifty-third
general meeting of the American Electrochemical Society
at Bridgeport, Conn., April 26, 1928. Colin G. Fink in
the chair.

\(^2\) M. Berthelot, 'Essai de Mécanique Chimique,' Vol.
II, Chap. 11 (Dunod, Paris, 1879).

\(^3\) Zeit. f. techn. Physik., 1925, p. 625.
67 (1745)

Science 67 (1745), x-590.

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