

If, however, we are prepared to regard the ions as forerunners of the true reactive species, with further reservations as to the accuracy of measurement of ion-concentration, the above-mentioned proportionality may be explained, as well as the onset of reaction, when controlled electrons are used, at the lowest ionization potential². Once ions have been formed, a variety of processes may occur which cannot be observed while the current is purely electronic. Such processes are:

- (a) ready dissociation, for example, of N_2^+ and H_2^+ , to give the reactive atoms³;
- (b) genesis of excited states which may also be reactive or give rise to reactive bodies;
- (c) formation of fast neutral bodies by the electron interchange reaction



where A^+ and B^+ are the primary and secondary ions⁴;

(d) production of similar high-speed species by the escape of an ion, after undergoing cathodic neutralization, with a considerable fraction of the kinetic energy which is acquired, while moving in the charged condition, under the influence of the applied fields⁵;

(e) kinetic activation of molecule by ion, as a knock-on effect⁶.

To indicate only some of the apparent advantages of this theory, processes (c), (d) and (e) can account for the influence of cathode material occasionally observed⁷, as well as the production of several molecules of reactant for each ion present¹.

In another communication, shortly to be published elsewhere, these views will be further developed and shown to provide a ready explanation for the electrical synthesis of nitric oxide, treated, as is suggested, as an essentially thermal process.

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¹ Willey, summary at Faraday Society's conference upon Free Radicals, 1933.

² Caress and Rideal, *Proc. Roy. Soc., A*, **115**, 684 (1927); Wansbrough-Jones, *ibid.*, **A**, **127**, 511 (1930).

³ Smyth, *Rev. Mod. Phys.*, **3**, 347 (1931).

⁴ Kallman and London, *Z. phys. Chem.*, **23**, 207 (1929).

⁵ Compton, *Phys. Rev.*, **36**, 706 (1930); Oliphant and Moon, *Proc. Roy. Soc., A*, **127**, 373 (1930).

⁶ Kennard, *Phys. Rev.*, **31**, 423 (1928).

⁷ Briner *et al.*, recent papers in *Helvetica chimica Acta*.

Continuous Absorption Band of Rubidium in the Presence of Foreign Gases

A NEW absorption band has been observed, with a Hilger H_1 glass spectrograph, on the shorter wavelength side of the second member of the rubidium principal series, in the presence of neon, helium, hydrogen or nitrogen. The position of the band depends on the nature of the foreign gas admitted into the absorption tube, which was kept at around 250° C. A pressure of a few centimetres of mercury of the foreign gas was sufficient to make the band appear distinctly. Fig. 1 is a sample spectrum taken when neon gas was present in the absorption tube of rubidium vapour, and Fig. 2 the corresponding microphotometer curve.

The bands due to other foreign gases are more diffused than that due to neon. All of them are partially superposed with the broadened line $5S-6P_{3/2}$. The wave-lengths of the maxima of these bands and

their widths are given below:

Foreign gas	λ	Width
Ne	4194.5 Å.	16 Å.
N_2	4183.0	24
He	4182.5	35
H_2	4178.7	38

These bands have certainly nothing to do with those due to polarization molecules of rubidium observed by one of us¹, for the latter do not appear below 300° C. In fact, when the absorption tube was heated to 350° C. without addition of any foreign gas, we observed a band at 4188 Å. This band was also observed without change of position, together with the new absorption band due to neon, when the latter was present as the foreign gas with a partial pressure nearly equal to that of the rubidium vapour.

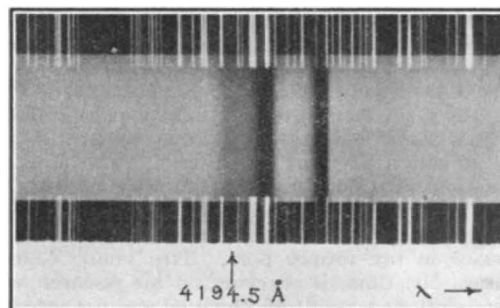


FIG. 1.

The narrow continuous band of potassium in the extreme red recently observed by T. Okuda² is probably of similar nature. The presence of hydrogen would be necessary for its appearance.

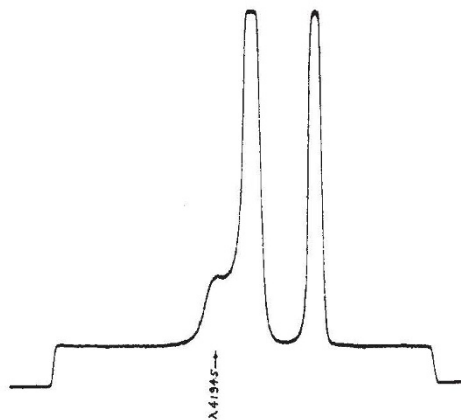


FIG. 2.

The existence of these diffuse bands may be explained as due to the inverse process of what has been observed by O. Oldenberg³ in the fluorescence of mercury vapour with addition of rare gases, the absorption being produced by a rubidium atom at the moment of a collision with a foreign gas atom.

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Peiping. Oct. 23.

¹ Ny Tsi-Zé et Choong Shin-Piaw, *J. Phys. et le Rad.*, **6**, 203 (1935).

² T. Okuda, *NATURE*, **138**, 168 (1936).

³ O. Oldenberg, *Z. Phys.*, **47**, 184 (1928); **51**, 605 (1928); **55**, 1 (1929).