

molecule, and a determination of the molecular constants with given conditions makes it finally probable that both SO₂ and ClO₂ are equilateral triangles, the length of side being approximately 1.37 Å. in each case, while there is a single linking between the oxygens and the central atom. The two molecules both have in addition a non-localised proper function, which in the case of sulphur dioxide is filled with two electrons giving a non-localised bond accounting for the stability of the substance compared with the chlorine compound. This application of a conception recently due to Hund² is confirmed by the values of the force constants, which are 9.7 × 10⁵ dynes per cm. for SO₂, and 6.7 × 10⁵ dynes per cm. for ClO₂. An equilateral triangular structure is probably the only structure compatible with non-localised proper functions.

In the case of chlorine monoxide certain of the bands overlap, and the observed values cannot at present be taken as more than reasonable approximations. We have $\nu_1=639$, $\nu_2=973$, $\nu_3=1245$, $2\nu_1=1305$ cm.⁻¹. On the older polarisation theory one would have expected a rectilinear structure for this substance. Examination shows, however, that the molecule is triangular with vertical angle approximately 90° and again single linkings ($f_1=6 \times 10^6$ dynes/cm.) between the chlorine and oxygen atoms. The existence of a considerable repulsive force between the two chlorine atoms is shown by the magnitude of f_2 , the force constant for the particles at the base of the triangle, which rises from 1.7 × 10⁶ dynes/cm. for SO₂ and ClO₂ to 5 × 10⁶ dynes per cm. for Cl₂O.

C. R. BAILEY.
A. B. D. CASSIE.

The Sir William Ramsay Laboratories
of Inorganic and Physical Chemistry,
University College, London.

¹ *Phys. Rev.*, **38**, 2131; 1931.
² *Z. Phys.*, **73**, 1 and 565; 1932.

Fluted Band at $\lambda 3900$ Å. in the Spectrum of Mercury

It has already been observed by J. Stark and by others that a fluted band system of mercury at $\lambda 3900$ Å. is superposed on the continuous spectra, covering the visible and the ultra-violet regions, but, so far as we know, nothing has been reported about the origin of this band.

We have observed the band, and Fig. 1 is a reproduction of its photometric curve. We excited the

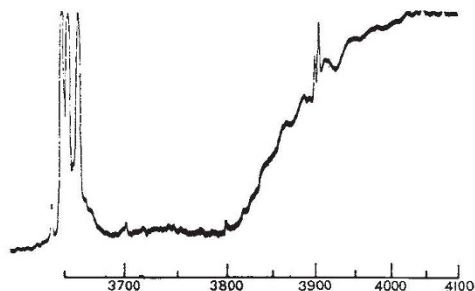


Fig. 1.—Photometer curves of the mercury band spectrum with wave-length scale in angstrom units.

vapour with a high-frequency oscillatory current of about 5×10^8 cycles. The oscillation was produced by a spark maintained by a valve oscillator working at 3×10^6 cycles. On plotting the frequency differences as a function of wave-number, as shown in Fig. 2, the convergence limit was estimated to be 27,150 cm.⁻¹,

which falls near the strong triplet lines at $\lambda 3650$ Å. Therefore it seems reasonable to assume that the band has a close relation with these lines. From this point of view, it is considered that the bands are connected with the 3³D state of the mercury atom;

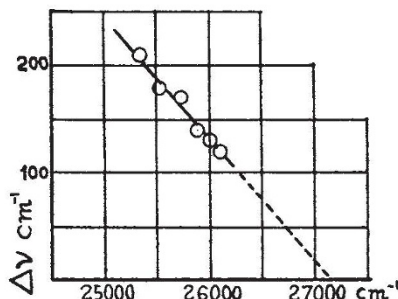


Fig. 2.

consequently they are emitted by the transitions between the levels the dissociation products of which are the excited 3³D atom, and the normal, and the next lower levels connected with the 2³P of the atomic states, from which, as it is usually accepted, the other visible and ultra-violet band systems are initiated.

J. OKUBO.
E. MATUYAMA.

Physical Laboratory,
Tôhoku Imperial University,
Sendai, Japan.

A New Band System of Beryllium Oxide

In an attempt to get bands of the beryllium molecule, I found in an arc between a carbon and a beryllium electrode several new bands in the red and infra-red region. The analysis of these bands showed that they are, however, not due to beryllium but to the oxide, BeO, the lower level being the same as that of the well-known visible BeO-bands analysed by Bengtsson,¹ and Rosenthal and Jenkins.² As until now only two electronic states (both ¹Σ) of the molecule BeO are known, namely, the lower and upper states of the visible bands, it seemed worth while to analyse the new bands in detail, in order to get more information about the electronic structure of this molecule, especially with respect to the question of valence and dissociation products.

The heads of the bands, which are shaded towards the red, are not very pronounced, and since there is much overlapping of different bands, the whole system looks under high dispersion rather like a many-line spectrum. The analysis showed that in spite of their complicated appearance, the bands have only single P, Q, and R branches. As the lower state is ¹Σ, the transition is ¹Π → ¹Σ, the ¹Π level lying between the two ¹Σ levels mentioned above. This upper level is just the state one would expect according to the electronic configuration of BeO.³

So far, three bands have been analysed (Table 1).

TABLE 1

v' \ v''	0	1
0	13647	
1	14710	
2		14293

The v' -numbering may be shifted, if more bands are found, farther in the red. The vibrational quantum of the upper state (¹Π) is very much lower than that of the ground state (¹Σ), as calculated by Rosenthal and Jenkins.² The ΔG values are: $\Delta G'_{\frac{1}{2}} = 1063$,