and the totals summed for each mass in the group. The distributions calculated and found are shown in the graphs of Figs. 1 and 2. Particularly useful are the maximum peak heights at 440, 438, 359, 280, 278. The peak 199 appears among the mercury isotopes. The main discrepancy between the distributions calculated and found just above mass 444 is probably due to an impurity.

Some of the peaks are quite complex. For example, the highest peak of mass 359 in the SnBr_3 ion is made up of: $^{116}\text{Sn}^{81}\text{Br}_3$, $^{118}\text{SnBr}_2^{79}\text{Br}$, $^{120}\text{Sn}^{81}\text{Br}^{79}\text{Br}_2$ and $^{122}\text{Sn}^{79}\text{Br}_3$.

If pure, stannic iodide, even though less volatile, would furnish excellent mass markers. Since iodine is monoisotopic, all the ions would exhibit the tin isotopic distribution pattern, with masses of the highest peak in each group at 628, 501, 374 and 247. These are for the iodine containing ions formed with tin-120. However, any slight bromine contamination in the iodide yields a great number of mixed iodide-bromide peaks, due to the large number of such combinations possible.

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¹ *Handbook of Chemistry and Physics* (Chemical Rubber Publishing Co., Cleveland, 1961).

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Absorption Spectra of the D-State Ions TiCl_6^{-3} , TiCl_4^- , CrCl_4^{-2} , FeCl_4^{-2} and CuCl_4^{-2} in Chloride Melts

THE absorption spectra of dilute solutions of the ions TiCl_6^{-3} , TiCl_4^- , CrCl_4^{-2} , FeCl_4^{-2} and CuCl_4^{-2} in chloride melts have been obtained. Of particular interest is the magnitude of Dq , the crystal field splitting parameter, deduced from the locations of the near infra-red absorption bands. In the present communication, a detailed discussion of the spectra and their interpretation in terms of distortions of the complexes will not be given. The salient results of the investigation are, however, listed in Table 1, this constituting the first report of the tetrahedral spectra of a number of these ions.

Table 1. ABSORPTION SPECTRA OF D-STATE IONS IN CHLORIDE MELTS*

Ion	Electronic configuration	Energy at absorption maxima (cm. ⁻¹)	Width at half-maxima (cm. ⁻¹)	Transition	Dq (cm. ⁻¹)
TiCl_6^{-3}	d^1	10,000	4,000	T → E	~1,150
	3d	13,000	3,500		
TiCl_4^-	d^1	8,000	3,500	E → T	~700
	3d	6,000	3,000		
CrCl_4^{-2}	d^4	9,800	4,600	T → E	980
	3d				
FeCl_4^{-2}	d^6	5,100	3,100	E → T	510
	3d				
CuCl_4^{-2}	d^9	9,500	3,400	T → E	950
	3d				

* The solvent was LiCl-KCl eutectic and the temperature 400° C. in all cases except TiCl_4^- where the solvent was CsGaCl_4 and the temperature 750° C.

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Absorption and Afterglow Spectra of Selenium Dioxide

IN a report now in the press¹ we have attempted to interpret the continuous emission and absorption spectra of sulphur dioxide by assuming a photo-dissociation and recombination process.

In this report, we extend the examination to the selenium dioxide molecule, which has an electronic configuration similar to that of sulphur dioxide (and also tellurium dioxide). As with the other diatomic oxides, the energy of the excited levels decreases as one goes to heavier molecules: that is to say, from sulphur dioxide to selenium dioxide and then to tellurium dioxide. One would expect a corresponding shift in the respective continuous and discrete band spectra.

In studying this molecule, we used the same photometric method as for sulphur dioxide. To stabilize the concentration of selenium dioxide, we connected two furnaces (F_1 and F_2) so that F_1 had the solid oxide contained in a side tube while the other, F_2 , operating at a higher temperature, contained the absorption vessel connected to the small tube in F_1 .

The range of temperature in the F_1 furnace was quite limited because at less than 250° C. the vapour pressure was too low for adequate absorption measurements, while, near 300° C., the absorption was almost complete in the region between 2600–3000 Å. This use of two furnaces allowed the investigation of the influence of the temperature on the absorption spectra.

The absorption band spectrum has been examined by Evans², Choong-Shin-Piaw³ and Duchesne and Rosen⁴. Most of the bands have been classified in three distinct groups, corresponding to the spectral regions: (A) 2070–2210 Å.; (B) 2210–3300 Å.; (C) 3400–3800 Å.

As in the case of sulphur dioxide, raising the temperature has a double effect: (1) the rotation structure of the individual bands is made to disappear progressively into a continuous absorption spectrum; (2) a new continuous spectrum appears which is associated with the increase of the total absorption.

It is this last absorption which was measured. For a given temperature in the F_1 furnace—that is to say, for a given value of pressure—we measured the optical density $d(T_1)$ and $d(T_2)$ corresponding to the two different temperatures of the furnaces F_1 and F_2 .

In the regions where there was no new absorption, $\frac{d(T_2)}{d(T_1)} \approx 1$. This was indeed the case for the bands located in the 2500–3000 Å. spectral region. In other spectral regions, the excess density:

$$d_e = d(T_2) - d(T_1) \quad T_2 > T_1$$

was arbitrarily assumed to be equal to that of the continuous absorption.

Fig. 1 shows our results for $T_1 = 250^\circ \text{C.}$ and $T_2 = 370^\circ \text{C.}$ With rising temperature, two regions of continuous absorption appear: one between 3000–3350 Å. and the other less than 2600 Å. The maximum absorption cross-section was of $8 \times 10^{-21} \text{ cm.}^2$ at 250° C.

As is well known, for diatomic molecules, the absorption spectrum may be continuous in one spectral region and discrete in another when both the electronic states of the transition are stable. The absorption is entirely continuous, or shows broad intensity fluctuations, when one of the potential curves is of a repulsive type. In the first case, the