

is perpendicular to the direction of the fastest growth of the crystals. The dimensions of the unit cell are the following: $a = 20.6$ Å., $b = 21.1$ Å., $c = 7.55$ Å., $\beta \sim 89.5^\circ$. The density is 2.98. This value corresponds to 27.6, that is, 28 formula units in the unit cell. As in all photographs the reflexions from the faces $h0l$ with $h + l = 2n + 1$ and $0k0$ with $k = 2n + 1$ are missing, the space group $C_{2h}^5 - P2/c$ is probable. An investigation of the grouping of the 252 atoms in the unit cell has not been attempted.

Powder photographs of melts with the following compositions were taken:

- (1) $2(2 \text{ CaO} + \text{SiO}_2) + \text{NaF}$
- (2) $2 \text{ CaO} + \text{SiO}_2 + \text{NaF}$
- (3) $2 \text{ CaO} + \text{SiO}_2 + 2 \text{ NaF}$
- (4) $2 \text{ CaO} + \text{SiO}_2 + 3 \text{ NaF}$.

Preparation 1 showed the reflexions of $\text{Ca}_2\text{SiO}_4\text{NaF}$ and some other lines which could not be identified. Preparation 2 showed only the reflexions of $\text{Ca}_2\text{SiO}_4\text{NaF}$. Preparations 3 and 4 showed the lines of $\text{Ca}_2\text{SiO}_4\text{NaF}$ and of NaF. In all photographs the interferences belonging to the $\text{Ca}_2\text{SiO}_4\text{NaF}$ phase were identical as regards intensity and position. Thus the stoichiometrical composition of $\text{Ca}_2\text{SiO}_4\text{NaF}$ seems to be very well defined, and no addition compounds with the ratio NaF: Ca_2SiO_4 greater than 1 seem to exist.

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Emission Bands of the Fluctuation Type in the Spectrum of Iodine

As part of an investigation undertaken in this laboratory on the emission spectra of halogens and halogen derivatives of methane¹, the emission spectrum of iodine is being studied. The spectrum is excited by a high-frequency as well as a transformer discharge in iodine vapour of pressure equivalent to the saturated vapour pressure of iodine at room temperature. A Steinheil 3-prism glass spectrograph and medium Hilger quartz and constant-deviation glass spectrographs have been used as resolving instruments. Super Panchro-press *P* 1200 and Process Regular *B* 20 Kodak plates were used.

The spectrum in all cases consists of a large number of diffuse broad bands in the region 4800–3450 Å. to which, only, the present note relates. Previous investigators² have, however, recorded in this region only wave-lengths of the maxima of two continuous (?) bands at 4800 and 4300 Å. and a weak one at 4020 Å. In the present experiments the so-called continuous band at about 4800 Å. is one of the eight diffuse bands which form one group. Similarly the band at about 4300 Å. is one of the seven and that at 4020 Å. one of the five bands in the second and third groups respectively. Between 3950 Å. and the well-known continuum at 3414.3 Å., we have the fourth group of such diffuse bands.

All these details are more clearly brought out on the process than on the panchromatic plates, which do not give much contrast. It is probably for this reason and also because low-dispersion instruments are generally used in this rather difficult region, particularly below 4100 Å., that the details of the

spectra might have escaped the attention of previous investigators. Thus, for example, the four bands observed here between 4094 and 4017 Å. appear, under low dispersion, as a single band. The accompanying table gives the wave-lengths of the maxima of all the bands observed in the region 4750–3475 Å. The intensities given refer to visually estimated values for the bands as obtained on the process plates, the sensitivity of which falls rapidly above 4350 Å. For this reason, the intensity values of the first group of bands do not give correct information of the relative intensities of these bands. The panchromatic plates show that the bands at 4747.2 and 4662.1 Å. are, along with that at 4575.6 Å., the strongest in the first group.

Group	Int.	λ in air (Å.)	ν vac.	Group	Int.	λ in air (Å.)	ν vac.
I	0	4747.2 B	21059	IV	10	3944.1	25347
	1	4662.1 B	21444		2	3918.7	25511
	3	4575.6 B	21849		6	3879.7	25768
	2	4517.7	22129		6	3855.8	25928
	4	4471.0	22360		3	3820.1	26170
	2	4430.7	22563		4	3798.0	26322
	3	4389.4	22776		1	3770.4	26515
	3	4353.3	22965		1	3751.2	26651
					1	3739.5	26734
	5	4316.8	23159		2	3720.1	26873
II	8	4280.9	23353		2	3685.6	27118
	8	4241.8	23568		2	3668.9	27248
	6	4201.5	23794		2	3640.2	27463
	5	4155.5	24058		2	3622.8	27595
	4	4123.3	24246		2	3600.7	27764
III	5	4093.5	24422		1	3577.4	27945
	5	4067.0	24581		1	3555.4	28277
	5	4044.9	24716		?	3513.1	28457
	3	4017.4	24885		1	3500.1	28562
					1	3479.6	28731

The bands seem clearly to belong to the so-called fluctuation type of bands³ and are probably due to a transition between two electronic states, the lower of which possesses a flat potential energy curve. The first three bands are very broad (*B*), the over-all widths being about 332, 239 and 240 cm^{-1} respectively. All the other bands which are also broad have an average width of about 115 cm^{-1} . This fact probably indicates that the flat final level is common to all of them. Excepting the first three bands in group I, the average wave-number difference between successive bands in the first two groups is about 214. The same difference in bands of group III is about 154. The bands of group IV appear to occur in doublets of which six are very obvious and are shown as such in the table. The average wave-number difference of these doublets is again of the order of 158. The occurrence of these two wave-number differences (~ 214 and 154) strongly suggests that the bands are due to the diatomic molecule I_2 . This and the fact that the bands occur in four distinct groups suggest that they involve more than one electronic level for their initial states, the wave-number differences between corresponding bands of successive groups being of an order of magnitude which is too big to be regarded as a vibrational frequency of the iodine molecule. Further elucidation of these bands must await the investigation on the other regions of the iodine spectrum which is in progress.

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¹ Cf. Asundi, Singh and Mishra, *Curr. Sci.*, **12**, 204 (1943).

² Cf. Curtis and Evans, *Proc. Roy. Soc., A*, **141**, 603 (1933).

³ Herzberg, "Molecular Spectra", 462 (1939).