

### ON THE SPECTRUM OF FLAME CONTAINING POTASSIUM SALTS

PANAY<sup>1</sup> has reported a continuous spectrum of potassium obtained by introducing into a Mecker burner air carrying atomised KCl solution. He has examined the intensity distribution in this spectrum between  $\lambda$  5600 and  $\lambda$  4110 and found a maximum at  $\lambda$  4430 and a minimum at  $\lambda$  5400. The continuous spectrum extends farther into the ultra-violet with gradually diminishing intensity and in the visible region, superposed over the continuum are a few lines of potassium, viz.,  $\lambda$  7699-65,  $\lambda$  4047-44 lines of the principal series,  $\lambda$  6939-11,  $\lambda$  5340-23 lines of the sharp series and  $\lambda$  5360 line of the diffuse series, the D lines of sodium and two feeble lines at  $\lambda$  4947 and 4637. A band at  $\lambda$  5650 and another between  $\lambda$  6180 and  $\lambda$  6460 spreading possibly to  $\lambda$  6050 and  $\lambda$  6730 have also been noted by him.

To understand clearly how the continuum and the different bands and lines noted by Panay arise, the spectrum of flame containing atomised KCl has been photographed in essentially the same manner as by Panay and a continuous spectrum extending from the long wavelength limit of an Ilford panchromatic plate down to about  $\lambda$  3000 Å (fainter continuum extends to even shorter wavelength) has been obtained. The continuous spectrum in the visible region shows a maximum and a minimum near the regions described by Panay and has superposed over it the D lines, the C<sub>2</sub> bands at  $\lambda$  5636,  $\lambda$  5165,  $\lambda$  4737,  $\lambda$  4382, and the strong members of the OH bands at  $\lambda$  3064. The red K lines could be seen visually but were beyond the sensitive region of the plate. The second members of the principal series of potassium appeared but no sharp series or diffuse series lines mentioned by Panay were obtained.

To eliminate the effect of the gas flame, its spectrum uncontaminated by any salt, was photographed. This showed essentially the same features as above (including even the D lines). The inner cone of the flame gave the bands much stronger over the continuum than the outer cone. Further, the continuum was stronger in the flame containing KCl than in the one without it. The spectrum was also photographed with atomised NaCl in the flame. This again showed the same features as the KCl flame; the D lines were stronger.

It thus seems that the continuum refer-

red to by Panay has nothing to do with potassium in particular. It rather belongs to the type of continuum which is ordinarily present in the flame and which has been attributed mainly to continuous electron radiation, i.e., radiation of the electrons in the field of ions formed in the discharge, by Finkelburg.<sup>2,3</sup> The introduction of easily ionizable atoms like those of Li, Na, or K makes the continuum considerably stronger. Part of the spectrum might also be due to bimolecular association of the type of  $\text{NO} + \text{O} = \text{NO}_2$  + yellow green continuum of the flame (see Gaydon<sup>4</sup>). Further, it is also difficult to see how some of the lines can be attributed to the sharp and diffuse series of potassium, as has been done by Panay, when intervening members of the series like the  $\lambda$  5802 line of sharp series and  $\lambda$  5832 of the diffuse series are absent. By assuming that the wave-lengths given by Panay are only approximate it is possible to explain some of the radiations as due to C<sub>2</sub> or CH, but it does not appear feasible to explain all of them in any satisfactory manner. In the present case, however, although a continuum similar to Panay's has been observed, no extra radiation which cannot be explained has been found to appear on the plate.

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1. Panay, T. N., *Compt. Rend. Acad. Sci. Paris*, 1937, **204**, 251.
2. Finkelburg, W., *Phys. Rev.*, 1934, **45**, 341.
3. —, *Ibid.*, 1934, **46**, 330.
4. Gaydon, A. G., *Proc. Roy. Soc., A*, 1944, **111**, 183.

### NEW BANDS OF COLUMBIUM OXIDE

AN extensive band spectrum consisting of red-degraded bands and attributable to the CbO molecule has been observed in the region 6500-4200 Å.U., in the ordinary Columbium arc in air and in heavy current discharge through CbCl<sub>5</sub> vapour. They could be distinguished as two systems: (1) from  $\lambda$  6500-5600 and (2) from  $\lambda$  5600-4200. The first system presents a complex vibrational structure. The second is more open and well defined with band-heads accompanied by partially resolved rotational structure. The prominent heads occur in widely separated regions at  $\nu$  19120, 20340, 21320, 22163, 22878, the separations between successive heads being 1220, 980, 843 & 715

cm.<sup>-1</sup> The intensity distribution in these heads suggests the probability of  $\nu$  20340 as the (0, 0) head. The two systems may be designated as  $\gamma$  and  $\alpha$  respectively, on the analogy of the  $ZrO^1$  and the  $TiO^2$  bands which the present bands resemble closely.

Analysis of the bands is in progress and details will be published shortly.

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1. F. Lowater, *Proc. Phy. Soc.*, 1932, **44**, 51.
2. *Ibid.*, 1928, **41**, 557.

#### GYPSIFICATION OF APATITES IN THE KODURITES

DURING the course of detailed chemical and optical studies of the Kodurites from the manganese mines of the Garividi area in the Vizagapatam district, a rather unusual case of the alteration of apatite to gypsum along the peripheral zones was noticed. The apatite is a manganese fluor variety with the formula  $3(Ca.Mn)_3.P_2O_8.Ca(F_2.Cl_2)$ . During the optical examination, it was noted that the periphery of the apatite showed different optical features from those normal to the apatite. The central grain shows uniaxial negative characters with straight extinction, whereas the peripheral zone is biaxial negative with inclined extinction which polarizes with second order blues and pinks, characteristic of gypsum. The analysis of the apatite and its modal composition indicated 92.93% of apatite and 7.07% of gypsum.

Chertification and kaolinisation are universal in the Kodurites. The problem of the origin of the cherts and kaolin in this area as elsewhere is a debatable point, i.e., whether it is due to hydrothermal or meteoric alteration.

Vogt<sup>1</sup> in common with several other investigators attributed kaolinisation of the felspars to carbonated waters. Lindgren<sup>2</sup> controverted this view on the ground that the pure aluminic silicate cannot be formed in the presence of carbonated waters alone and that the presence of  $H_2SO_4$  is essential to bring about kaolinisation. Fermor<sup>3</sup> ruled out this possibility on the ground that there was no evidence of the presence of the influence and action of  $H_2SO_4$  in the Kodurites. The gypsification of the apatites in the

Kodurites of the Garividi area is fairly frequent and this points clearly to the action of sulphuretted waters. Therefore, it appears that the view put forward by Lindgren regarding the importance of  $H_2SO_4$  in kaolinisation of felspars really finds a support here since there is a replacement of apatite by gypsum ( $CaSO_4 \cdot 2H_2O$ ). The authors do not, however, claim that this alteration is brought about exclusively by hydrothermal agencies.

We are not aware of any reported occurrence of the gypsification of apatites in literature.

A detailed paper embodying the results of chemical and optical study of the Kodurites and associated formations by one of us (G.P.R.) is under publication elsewhere.

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March 16, 1949.

1. Vogt, *Trans. Amer. Inst. Ming. Eng.*, **31**, 150.
2. Lindgren, Waldemer, *Ibid.*, **30**, 658.
3. Fermor, L. L., "Manganese-Ore Deposits of India," *Mem. G. S. I.*, **37**, 274-75.

#### VANADAMETRY—PART III

##### Volumetric Estimation of Ferrous Salt in the Presence of Phenols

IN Parts I and II of this series the advantages of sodium vanadate as a volumetric reagent in place of permanganate or dichromate have been emphasized. Viswanadham and Gopala Rao<sup>3</sup> have shown that citric acid in ferrisubchloridum citratum B.P. interferes in the estimation of ferrous iron, by potassium dichromate. They have proposed the use of sodium vanadate. Lyons and Appleyard<sup>1</sup> who found a similar interference by citric acid and sugars proposed ceric sulphate for the estimation. Ferrey<sup>5</sup> showed that ceric sulphate does not give satisfactory results in the estimation of ferrous iron in the presence of phenol. As several phenolic compounds are used in pharmaceutical preparations as preservatives, it was considered necessary to investigate the problem in detail.

We have now found that dichromate oxidizes phenol, ortho-cresol, paracresol, *m*-cresol, and resorcinol, in the presence of ferrous salts by an induced mechanism. Ceric sulphate is capable of oxidizing the phenolic compounds even in the absence of ferrous salts to dirty coloured compounds