

**PIGEONITE IN CERTAIN DOLERITE DYKES NEAR ROBERTSONPET (KOLAR)**

CERTAIN "abnormal" dolerite dykes (meta-dolerites) from the charnockitic areas in Mysore have been described by Mr. B. Rama Rao<sup>1</sup> Director of Geology, Mysore Geological Department and Mr. P. R. J. Naidu, Assistant Professor of Geology, University of Mysore. Naidu, while describing the pyroxenes of such dolerite dykes near Halagur and Dodkanya (two other charnockitic areas), calls them "Pigeonite"<sup>2</sup>. So far, this mineral has been reported to occur in Mysore in certain "abnormal" dolerite dykes which are associated with charnockites. But in this paper is set forth a detailed description of the optical characters of pigeonite which has been for the first time noticed to occur in certain dolerite dykes near Robertsonpet (Kolar), which are not at all associated with charnockites.

These dykes cut across the general foliation of the Champion gneiss and the ferruginous quartzites with a rough east-westerly trend. Microsections of specimens of the dykes show plagioclase laths and pyroxene plates disposed in a sub-ophitic texture. Most of the feldspars are plagioclase showing zoning and multiple twinning. There are occasional crystals of microcline and orthoclase.

Some of the pyroxenes are colourless while others are pinkish showing pleochroism. Many of them have reaction rims of green to bluish green hornblende. The blue tufts in the reaction rims pass sometimes into scales of reddish brown biotite. There are also intergrowths of augite and magnetite. Generally the diopside (colourless pyroxene) showing  $Z \wedge C = 36^\circ$  to  $43^\circ$  is intergranular but where the diopside is absent its place is taken up by altered minerals like chlorite or amphibole.

The pyroxene showing the pleochroism is pigeonite. It occurs as tabular prismatic crystals with an euhedral or subhedral outline. It shows positive elongation and positive optic sign, giving  $Z \wedge C = 30^\circ$  to  $43^\circ$ . The pleochroism exhibited by this mineral is as follows:—

- X = pink
- Y = brownish pink.
- Z = pale green.

Refractive Indices:—

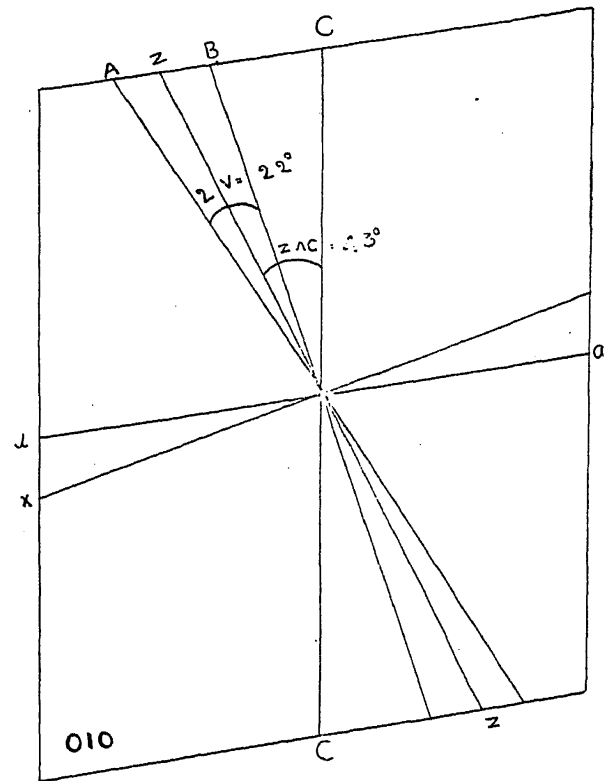
- $\alpha = 1.700$
- $\beta = 1.705$
- $\gamma = 1.725$

$(\gamma - \alpha) = 0.025$  (Berek's compensator)

It shows a small optic axial angle varying from almost uniaxial type where  $2V = 0$  to larger angles, generally  $18^\circ$  to  $22^\circ$ . The dispersion noticed is of the inclined type where  $r > v$  and hence the optic plane is parallel to (010). The parallelism of the optic axial plane to (010) indicates that this pigeonite is a calcic variety with about 7 to 10% of  $\text{CaO}$ .<sup>3</sup>

Wahl pointed out the general occurrence of pigeonite in basaltic rocks many years ago and Fermor concluded that pigeonite was the most abundant pyroxene in nature<sup>4</sup>. In 1900, Winchell examined the pyroxene of the olivine diabase of Pigeon Point, Minnesota. He found that this mineral showed abnormal optical properties. He concluded that the "abnormal"

optical properties of the mineral can scarcely be attributed to the chemical composition<sup>5</sup>. In 1906, Lacroix designated it clinoenstatite or clinohypersthene<sup>6</sup>, but later he adopted



- $2V = 18^\circ - 22^\circ, +ve$
- $\gamma - \alpha = 0.025$
- $Z \wedge C = 30^\circ \text{ to } 43^\circ$
- Positive Elongation
- X = Pink
- Y = Brownish Pink
- Z = Pale Green
- XZ || 010

Winchell's pigeonite<sup>7</sup>. It was re-defined by H. H. Hess of the Princeton University, New Jersey, in terms of composition, as a variety of pyroxene with a calcium silicate content of  $\text{W}_0$  varying between  $\text{W}_{05}$  &  $\text{W}_{15}$  ( $2V = 0$  to a maximum of  $< 32^\circ$ , augite and ferroaugite  $2V > 32^\circ$ ).<sup>8</sup>

Pigeonite from the granulites of the charnockite series has been described by Dr. Groves<sup>9</sup>. According to him, the pigeonites of Uganda are rich in clinoenstatite or clinohypersthene molecules and are classified under the diopside-hedenbergite series. Pigeonites from the "abnormal" dolerite dykes near Halagur and Dodkanya have been described by Mr. P. R. J. Naidu. He assigns them to the enstatite-diopside series.<sup>10</sup>

In the case of mixtures of the minerals of the two series (enstatite-diopside series or diopside-hedenbergite series), a formula of Mallard quoted by Wahl<sup>11</sup> shows that the extinction angles of mixed pyroxenes would be nearer to the members of higher extinction angles and higher birefringence. The pigeonite, described in this paper, shows extinction angles ranging from  $30^\circ$  to  $43^\circ$ , and birefringence, 0.025, that is, figures approaching the extinction angles and the birefringence of the hedenbergite end of the diopside-hedenbergite series. Hence this pigeonite is assigned to the diopside-hedenber-

gite series. Computed from Winchell's Variation diagrams<sup>1,2</sup>, it has a composition,  $5\text{CaMgSi}_2\text{O}_6 \cdot 6\text{CaFeSi}_2\text{O}_6$ . Therefore this pigeonite differs from the pigeonite of charnockitic areas in Mysore in belonging to the diopside-hedenbergite series.

M. G. CHAKRAPANI NAIDU.  
K. C. CHANNABASAPPA.

Department of Geology,  
Central College,  
Bangalore,  
June 15, 1948.

1. *Records M. G. D.*, 1940, **39**, 51. 2. *Curr. Sci.*, **12**, 4. 114-115. 3. A. N. Winchell, *Elements of Optical Mineralogy*, 1933, **2**, 222. 4. *Records G. S. I.*, 1925, **58**, 323. 5. *American Mineralogist*, 1900, **26**, 203. 6. *Bull. Soci. Nat. Onest.*, 1906, **6**, 81. 7. *Mineral France*, 1910, 767. 8. *American Mineralogist*, **26**, 517-518. 9. *Q. J. G. S.*, **91**, 155. 10. *Curr. Sci.*, **12**, 4. 115. 11. Tschermak's Min. U. Pet. Mittheil., *New Series.*, 1907, **26**, 116. 12. A. N. Winchell, *Elements of Optical Mineralogy*, 1933 **2**, 226.

### BAND SPECTRUM OF THALLIUM IODIDE

In a previous letter,<sup>1</sup> it is reported that bands of Thallium Iodide have been photographed in two regions: (1) from  $\lambda$  5300 to  $\lambda$  3750 and (2) from  $\lambda$  3680 to  $\lambda$  3600; the first presenting extensive groups mostly of red degraded bands and the second consisting of a few sequences of a brief system of violet degraded bands. Further work on these bands has shown that the first group of bands, interpreted previously as forming two overlapping systems, could be arranged into a single system corresponding to the transition  $3_1 \rightarrow 1\Sigma^+$  with the (0,0) band at  $25780.0 \text{ cm}^{-1}$  and having the vibrational constants  $\omega_e' = 94 \text{ cm}^{-1}$ ,  $\omega_e'' = 122 \text{ cm}^{-1}$  and  $x_e''\omega_e''$  having a small value, as observed previously. The analysis of the second brief system has led to the constants  $\omega_e' = 150 \text{ cm}^{-1}$  and  $\omega_e'' = 122 \text{ cm}^{-1}$ . Considering this system as due to the transition  $3^0\text{O}^+ \rightarrow 1\Sigma^+$ , the wave-number interval between the (0,0) bands of the two systems is found to be  $1321 \text{ cm}^{-1}$ , which is in keeping with the corresponding intervals of the other similar halide molecules. A complete discussion will be published elsewhere.

Andhra University,  
Waltair,  
April 30, 1948.

P. TIRUVENGANNA RAO.  
K. R. RAO.

1. *Curr. Sc.*, 1948, **17**, 121.

### ON SOME PHYSICO-CHEMICAL EVIDENCE OF THE DIVALENCY OF SILVER

The following physico-chemical evidence supports the theory of divalency of silver.

Values for certain physical constants of silver, calculated on the basis of the divalency

of the metal, are in good agreement with observed values for (a) vibration frequencies of atoms; (b) entropy, (c) distance of the closest approach of atoms and (d) velocity of sound.

The formulæ proposed by the author and employed in calculating the physical constants are as follows:—

1.  $v = \sqrt{K} \cdot v \frac{1}{2\pi} \sqrt{\frac{P-V}{V}} \cdot \frac{Ze^2}{r^3} \cdot \frac{N}{M}$ , for vibration frequencies of atoms;<sup>1</sup>

2.  $S_r = 3/2 R \ln \frac{M}{\left(K \cdot \frac{P-V}{V} \cdot \frac{Ze^2}{r^3}\right)} + 3 R \ln T$

+  $2/3 \left(C_p^2 \frac{T}{T_s} + A_0\right) + C$ , for entropies of metallic elements;<sup>2</sup>

3.  $D = f_1 \times f_2 (v) \frac{P}{V_i \times d^{K_1}}$ , for distance of the closest approach of atoms;<sup>3</sup>

4.  $S = L \left\{ \left( \frac{1}{2\pi} \cdot \sqrt{K} \sqrt{\frac{P-V}{V}} \cdot \frac{Ze^2}{r^3} \cdot \frac{N}{M} \right) \times \left\{ f_1 \times f_2 (v) \frac{P}{V_i \times d^{K_1}} \right\} \right\}$ , for the velocity of sound in metallic elements.<sup>3</sup>

In the above formulæ, P is parachor ( $P_{A_0} = 63$ ); V, atomic volume ( $V_{A_0} = 10.3$ ); Z, valency; e, elementary charge; r, atomic radius ( $r_{A_0} = 1.77$ );<sup>4</sup> M, atomic weight; T, temperature (298.1);  $T_s$ , temperature of fusion;  $V_i$ , ionisation potential ( $V_{i_{A_0}} = 7.54$ ); d, atomic diameter; N, Avogadro's constant;  $\sqrt{K}$ , a constant with value  $0.415 \times 10^{12}$ ; K,  $0.1722 \times 10^{24}$ ;  $A_0$ , 0.214; C, 96.5; R, 8.32;  $f_1 \times f_2 (v)$ , 0.615 for monovalent elements, 1.166 for bivalent elements, 1.05 for trivalent elements;  $K_1$ , 0.925; L, 2.54.

These formulæ, it should be noted, gave values in comparative agreement with the experimental ones for these physical constants in an appreciable number of cases.

The following table gives values of the above physical constants for silver, calculated on the basis of the divalency of the metal. The corresponding values, calculated on the basis that silver is monovalent are also given for comparison.

Physical Constants	Calculated values; Silver, Divalent	Calculated values; Silver, Monovalent	Values observed (and reference to authors)
Atomic frequency	$3.21 \times 10^{12}$	$2.27 \times 10^{12}$	$4.5 \times 10^{12}$ (5)
Entropy	50.08	56.8	42.76
Distance of closest approach of atoms	3.026	1.596	2.8767
Velocity of sound	2467	920	2645 <sup>8</sup>

It would be observed from the above table that the values of the physical constants for silver, calculated on the basis of its divalency,