

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.

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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.

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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 ( $P_{Ag} = 63$ ); V, atomic volume ( $V_{Ag} = 10.3$ ); Z, valency; e, elementary charge; r, atomic radius ( $r_{Ag} = 1.77$ );<sup>4</sup> M, atomic weight; T, temperature (298.1);  $T_s$ , temperature of fusion;  $V_i$ , ionisation potential ( $V_{i_{Ag}} = 7.54$ ); 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, 1.168 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,

are in better agreement with the observed values.

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1. Sen, B. N., *J. Indian Chem. Soc.*, 1934, **11**, 243.
2. —, *Chem. Phys.*, 1935, **32**, 300. 3. —, *Gazetta*, 1938, **10**, 68, 656-662. 4. Bragg, *Phil. Mag.*, 1920, **6**, 40, 169.
5. Nernst and Lindemann, *Z. Electrochem.*, 1911, **17**, 822. 6. "International Critical Tables," Vol V, 87.
7. Bragg, *X-Rays and Crystal Structure*, p. 163. 8. "International Critical Tables," Vol. VI, 465.

### STUDIES ON THE SUITABILITY OF SUGARCANE JUICE FOR THE GROWTH AND DISTRIBUTION OF SOME INTESTINAL PATHOGENIC BACTERIA

THE increase in the incidence of some intestinal infections during the warmer months in Bombay and the heavy sale of iced sugarcane juice as a drink suggested the possibility of the spread of some of the intestinal pathogenic bacteria through this source. The incidence of typhoid, paratyphoid, dysentery and cholera infections usually after the conclusion of certain religious fairs, e.g., Pandharpur and Nasik, where large quantities of juice are consumed by pilgrims indicates this possibility. The suitability of this drink as a vehicle for the transmission of these infections, and as a medium for the growth and viability of *E. typhosa*, *S. paratyphi*, *S. schottmuelleri*, *S. dysenteriae* (Shiga), *S. paradysenteriae* (Flexner), *E. coli communis* and *V. cholerae* has been studied.

The following is the average composition: Moisture 75.14%; total sugars (including the 1.16% of the fermentable monosaccharide) 13.60%; total proteins 0.24%; the other constituents which make up the remaining are pectins, lignins, crude cellulose, amides, aminoacids, gums and minerals. The pH of the juice varies from 6.8-7.0.

The microbiological examination of the juice revealed that the normal flora consists of Gram positive sporulating aerobic bacilli, *B. coarzens*, *B. rufescens* and a starch hydrolysing variant of *B. mesentericus*, *Micrococcus perflavus* and an unidentified *Saccharomyces*. The essentially Gram positive character of the above flora enabled us to study conveniently the fate of the different Gram negative test organisms even in the non-sterilized samples of the juice.

A number of preliminary studies with the undiluted, 50% diluted, unfiltered, muslin-filtered, steam-sterilized and filter-sterilized samples were made: during these studies, methods essential for determining viability, multiplication, virulence and pathogenicity were also standardized. Sugarcane juice for the experimental studies was used in six different dilutions, viz., 1:32 (3 1/8% solution), 1:16 (6 1/4%), 1:8 (12 1/2%), 1:4 (25%), 1:2 (50% solution), and in the undiluted state. These

dilutions were used in their non-sterile, filter-sterilized and also steam-sterilized states. These various samples were then seeded in test-tubes with 0.1 ml. saline suspensions (matching Opacity Tube No. 4) of 24-hour growths of the selected bacterial species and incubated at the room temperature (28° C.) after 0.1 ml. portion from each tube was removed for the quantitative estimations of the inoculated bacteria. Further 0.1 ml. portions removed from each tube at regular intervals of time were utilized for counting the bacteria by the methods worked out for the purpose<sup>1</sup> in this laboratory. Special media such as the MacConkey's agar, Wilson and Blair agar, Leifson's desoxycholate citrate agar and Aronson's agar, were utilized for the quantitative studies, and peptone water, nutrient broth and MacConkey's broth, for testing viability. The morphological, staining, biochemical and antigenic variations occurring in the bacteria were also followed by adopting suitable techniques. The results obtained indicate that multiplication and maximal survival periods for these bacteria vary not only from species to species, but also with regard to the dilution effected, the sterility status of the juice and other factors. It should be mentioned here, however, that the presence of *E. typhosa* and *S. schottmuelleri* in cane juice must be regarded as potentially dangerous in view of the fact that these bacteria are more tolerant to the juice (particularly the unheated samples) and that they not only show a multiplication stage but continue to live in this substratum for a few days without any appreciable loss in their general characteristics. Shiga and the Flexner dysentery strains, on the other hand, do not find the juice very favourable for growth; observations with *E. coli* show that his organism can and does remain potent in the juice and as such its presence in large numbers in the juice must be regarded, as we do in water analysis, as an index of contamination through faeces, soil, flies, finger, ice or other sources. For the cholera vibrios the cane juice, despite its fermentable saccharose contents, is a poor medium and consequently the danger of cholera infections through this channel is very remote.

Details of these investigations will be sent for publication elsewhere. In the meantime, it is pertinent to mention here that thus far three cases of infection (one of typhoid and two of food-poisoning) have been brought to our attention and all these cases had their suspected origin to this drink. Unfortunately, these cases came in too late for bacteriological confirmation.

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1. Reporter, R. N., "Suitability of certain foods and drinks for the growth and distribution of some intestinal pathogenic bacteria," *M.Sc.*, Thesis, Bombay Univ., 1944.