

LETTERS TO THE EDITOR

CRYSTAL DATA OF AN AMMONIUM SALT OF CYCLIC CYTIDINE-2', 3'- PHOSPHATE

THE cyclic-2', 3'-phosphate esters occur as intermediates in the breakdown of RNA. The cyclic cytidine-2', 3'-phosphate is also important as a substrate for the ribonuclease. We have now crystallized an ammonium salt of this nucleotide by slow diffusion of acetone into water solutions of the compound. The material precipitated mostly as powder, except in one crop which yielded four needle shaped crystals after a period of about five weeks.

Paper chromatography by descending technique was carried out on Whatman No. 1 paper, using the solvent isopropyl alcohol, conc. ammonia and water (7 : 1 : 2). From R_f values of cyclic cytidine-2', 3'-phosphate ($R_f = 0.375$) and cytidine 2'(3') phosphate (mixed isomers, $R_f = 0.118$) it was confirmed that the crystal was cyclic cytidine-2', 3'-phosphate.

Rotation, Weissenberg and Precession photographs were taken using Cu K_α radiation. The crystals belong to monoclinic system with the space group $P2_1$. The complete crystal data are given in Table I.

TABLE I
Crystal data of cyclic cytidine
2', 3'-phosphate

Formula	$C_9H_{11}N_3O_7P \cdot NH_4^+$
M.W.	322.2
System	Monoclinic
a	$9.74 \pm 0.02 \text{ \AA}$
b	$8.89 \pm 0.02 \text{ \AA}$
c	$7.24 \pm 0.01 \text{ \AA}$
β	98°
V	620.9 \AA^3
Z	2
$d_{\text{calc.}}$	$1.723 \text{ gm. cm}^{-3}$
$\mu(\text{Cu } K_\alpha)$	24.13 cm^{-1}
Systematic absences	0 \neq 0 k -odd
Space group	$P2_1$

The authors thank Dr. T. M. Jacob and Mr. A. S. Gopalakrishnan of Biochemistry Department of this Institute, for kindly supplying the material used in this study and for performing the paper chromatography test. They also thank Prof. P. S. Narayanan for his interest in this work.

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Bangalore-12, October 13, 1971.

FRANCK-CONDON FACTORS AND r -CENTROIDS FOR THE A-X SYSTEM OF THE SiH^+ MOLECULE

It is probable that the spectrum of SiH^+ appears in sources of astrophysical importance¹. In view of the interest in SiH Franck-Condon factors and r -centroids for the $A^1\pi-X^1\Sigma^+$ band system of this molecule have been reported in the present note.

The method of α -averaging proposed by Fraser and Jarman² and the computational technique described by Sankaranarayanan³ have been applied for the evaluation of Franck-Condon factors. Since for this system $\delta a/a < 5\%$, no r_e -shift correction has been applied. The r -centroids have been calculated by quadratic equation method suggested by Nicholls and Jarman⁴. The results have been presented in Table I. The basic molecular

TABLE I

v'' v'	0	1	2	3	4
(a) 0	0.1972	0.1792	0.1061	0.0628	0.0441
(b) 0	1.6395	1.7507	1.8441	1.9301	2.0128
(c) 0	25025.20	22936.52	20916.31	..	..
(a) 1	0.1424	0.1288	0.0589	0.0091	0.0032
(b) 1	1.6143	1.7313	1.8262	1.9127	1.9952
(c) 1	25415.38	23326.68	..	..	..
(a) 2	0.1071	0.0331	0.0030	0.0136	0.0501
(b) 2	1.5916	1.7151	1.8115	1.8984	1.9809
(c) 2	..	..	..	..	..
(a) 3	0.1200	0.0043	0.0027	0.0320	0.0308
(b) 3	1.5721	1.7022	1.8001	1.8874	1.9698
(c) 3	..	..	..	..	..
(a) 4	0.0738	0.0009	0.0278	0.0014	0.0606
(b) 4	1.5568	1.6930	1.7920	1.8796	1.9621
(c) 4	..	..	..	..	..

(a) Frank-Condon factors, (b) r -Centroids,
(c) Wavenumbers.

constants have been taken from the work of Douglas and Lutz¹. The calculated values of Franck-Condon factors are in good agreement with the observed visual intensities. As $rc_1 > rc_2$, the r -centroids show the expected increase with decrease in wavenumber.

The authors are thankful to Prof. D. Sharma and Dr. R. C. Maheshwari for helpful discussions.

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THE LASER-EXCITED RAMAN SPECTRUM OF *CLOSTRIDIUM PASTEURIANUM* FERREDOXIN

BECAUSE they would absorb the incident visible light, the study of coloured transparent biological molecules by Raman scattering has not been possible previously. However, Laser-Raman spectroscopy makes the study possible if the molecules do not absorb in the 6328 Å

region. Several spectroscopic techniques like Electron Spin Resonance, Mössbauer and Optical Absorption have been used to study these iron-sulphur proteins¹⁻⁴. But Raman scattering has not been applied so far.

The Raman spectra were recorded by using Spectra-physics 125 He-Ne Laser giving intense beam at 6328 Å and 50 mW power and Coderg recording spectrophotometer. The horizontally and vertically polarized spectra were recorded by using a quarter wave plate in the path of the beam. The use of interference filters in the path of the incident beam eliminated source lines other than the 6328 Å line.

The ferredoxin sample was first reduced with sodium hydrosulphite and then reoxidized by shaking in air.

The unreduced sample of *Clostridium pasteurianum* ferredoxin does not show any Raman lines. On addition of excess sodium hydrosulphite, three Raman lines at 145, 430 and 610 cm^{-1} are seen as shown in Fig. 1. All these

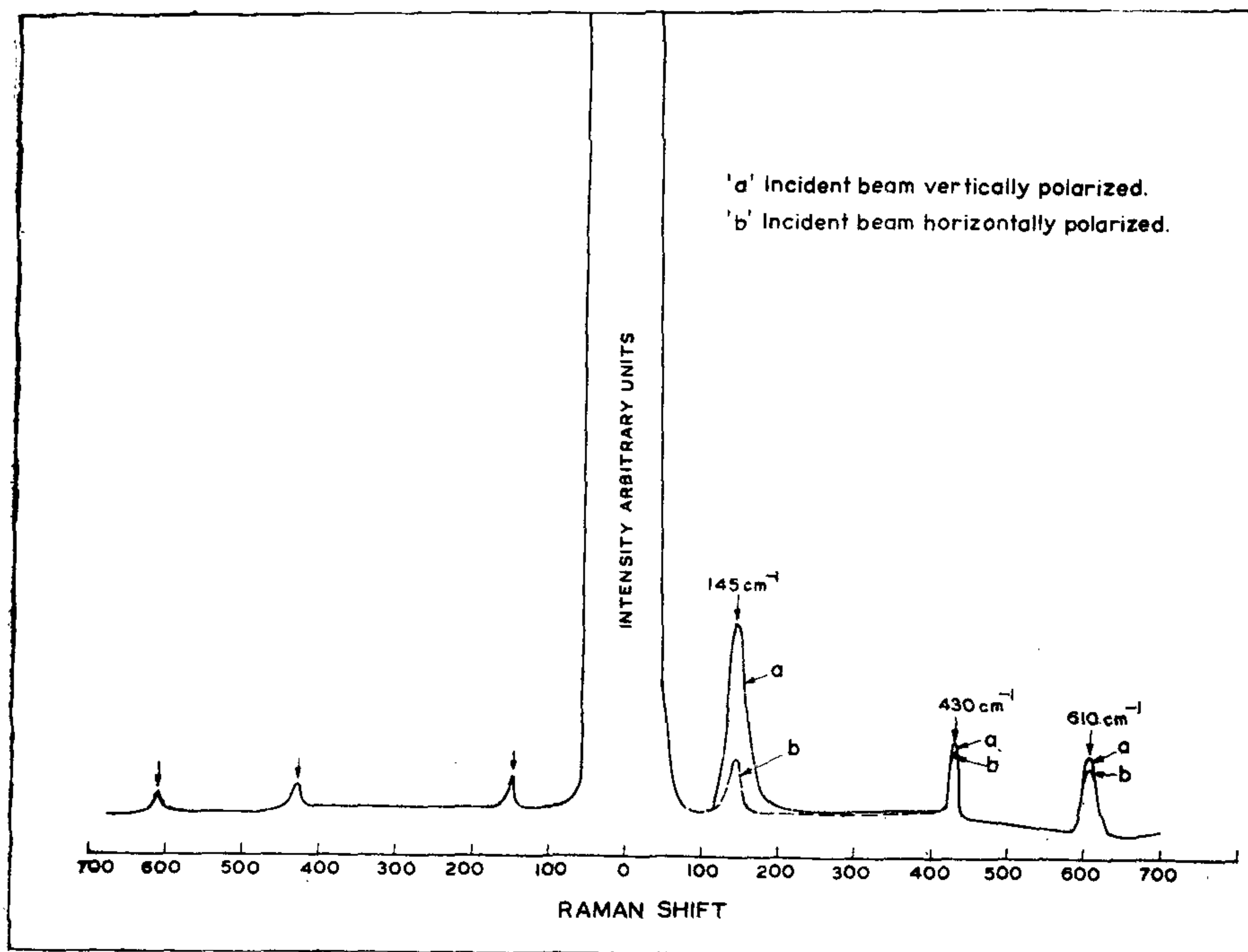


FIG. 1. The laser-excited Raman Spectrum of *Clostridium pasteurianum*. To 0.17 mg/ml protein in 0.1 M phosphate buffer of pH 7.2 a small amount of sodium hydrosulphite was added and spectrum taken after five minutes.