The effects of some other nucleotides on α-glucosidase formation were also studied. The results are presented in Table 2. They indicate that the de-repressive effect of cAMP cannot be due to the 3′,5′-ring structure alone; cyclic 3′5′-UMP and butyryl derivatives of cAMP have no de-repressive effects. A definite stimulative effect of ATP was exhibited under these experimental conditions. The de-repressive effect of cyclic 3′5′-GMP was to be expected.

Table 2. The effect of different nucleotides on the induction of α-glucosidase in baker's yeast protoplasts. The induction of α-glucosidase, the preparation of lysate and the assay of α-glucosidase were performed as described in the text. The induction medium (0.7 M $MgSO_4$ as osmotic stabilizer) was supplied with 1 % glucose and different nucletides to a final concentration of 1 mM. Activities are expressed as nmol of PNPG hydrolyzed/(min ml) lysate. The samples were taken 4.5 h after the start of induction.

Nucleotide [a]	α-Glucosidase activity
None	155
Cyclic 3′,5′-AMP	168
ATP	168
Cyclic 3′,5′-GMP	163
Cyclic 2′,3′-AMP	155
Cyclic 3′,5′-UMP	155
AMP	150
ADP	138
$O^{2'}$-MB cyclic 3′,5′-AMP	137
N^6,$O^{2'}$-DB cyclic 3′,5′-AMP	137
N^6-MB cyclic 3′,5′-AMP	121

[a] MB = monobutyryl, DB = dibutyryl.

The results obtained support the view that cAMP participated in the catabolite repression of yeast.

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Microwave Spectrum of Thiete 1,1-Dioxide

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Thiete 1,1-dioxide (*cf.* Fig. 1) was first synthesized by Dittmer and Christy in 1960.[1,2] A complete structural investigation by X-ray diffraction was performed by Lowenstein [3] in 1965. Within the limits of error of the method he found a planar ring structure with the plane of the O−S−O bond perpendicular to the plane of the ring. The refinement of the structure was not carried far enough to reveal the positions of the hydrogen atoms. The results of Lowenstein are tabulated in Table 1.

Table 1. Bond lengths and bond angles in thiete 1,1-dioxide as obtained by Lowenstein using X-ray diffraction.

Bond	Found, Å	Bond angle	Found
C−C	1.52±0.04	C−S−C	80.5°
C=C	1.39±0.03	S−C−C	85.1°
−C−S	1.79±0.04	S−C=C	90.0°
=C−S	1.77±0.03	C−C=C	104.5°
S−O	1.43±0.02	O−S−O	115.5°

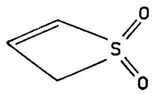

Fig. 1. Thiete 1,1-dioxide (thiete sulfone).

In the present investigation microwave spectra of the ground and three vibrationally excited states of thiete 1,1-dioxide and the second excited state of one of these modes were studied in the frequency region 26 500−40 000 MHz.

A sample of thiete 1,1-dioxide was kindly supplied by Dr. T. Kempe of the Department of Organic Chemistry, The Royal Institute of Technology, Stockholm.

The spectra were recorded on a Hewlett Packard model 8460 microwave spectrometer with a phase-stabilized source oscillator. All the measurements were carried out at room temperature with sample pressures in the range 15−25 mTorr.

Preliminary values of the rotational constants were calculated from an assumed structure based on Lowenstein's results and some reasonable additional assumptions as to the positions of the hydrogen atoms.

Only *a*-type *R*-branch transitions of $C_3H_4{}^{32}SO_2$ were observed. An attempt to identify transitions of the ^{34}S species proved fruitless, due to the poor signal-to-noise ratio at the temperature of the experiments. Observed and calculated frequencies of the lines belonging to the ground state are listed in Table 2.

Table 2. Ground state rotational spectrum of thiete 1,1-dioxide.

Transition	Observed [a] frequency (MHz)	Calculated frequency (MHz)	Calc.−obs. frequency (MHz)
$5_{15}\rightarrow 4_{14}$	29 308.78	29 308.72	−0.06
$5_{05}\rightarrow 4_{04}$	29 589.36	29 589.30	−0.06
$5_{24}\rightarrow 4_{23}$	29 718.49	29 718.46	−0.03
$5_{42}\rightarrow 4_{41}$	29 751.91 [b]	29 751.98	0.07
$5_{41}\rightarrow 4_{40}$		29 752.02	0.11
$5_{33}\rightarrow 4_{32}$	29 759.00 [b]	29 758.86	−0.14
$5_{32}\leftarrow 4_{31}$	29 763.34 [b]	29 763.56	0.22
$5_{23}\leftarrow 4_{22}$	29 864.38	29 864.34	−0.04
$5_{14}\leftarrow 4_{13}$	30 095.65	30 095.59	−0.06
$6_{16}\leftarrow 5_{15}$	35 152.95	35 153.00	0.05
$6_{06}\leftarrow 5_{05}$	35 435.28	35 435.31	0.03
$6_{25}\leftarrow 5_{24}$	35 648.29	35 648.38	0.09
$6_{51}\leftarrow 5_{50}$	35 700.74 [b]	35 701.14	0.30
$6_{52}\leftarrow 5_{51}$		35 701.14	0.30
$6_{43}\leftarrow 5_{42}$	35 708.00 [b]	35 707.84	−0.16
$6_{42}\leftarrow 5_{41}$		35 708.04	0.04
$6_{34}\leftarrow 5_{33}$	35 717.58 [b]	35 717.71	0.13
$6_{33}\leftarrow 5_{32}$	35 729.90 [b]	35 730.17	0.27
$6_{24}\leftarrow 5_{23}$	35 895.10	35 895.13	0.03
$6_{15}\leftarrow 5_{14}$	36 090.37	36 090.42	0.05

[a] Frequencies are accurate to ±0.05 MHz.
[b] Not used in calculation of rotational constants. The inaccuracy of these frequencies is caused mainly by overlapping by nearby lines or vibrational satellites.

Tables 3 and 4 present the resulting rotational constants of the ground state and the vibrational satellites. No attempt was made to assign the satellites to any particular vibrational modes. The centrifugal distortion was found to be negligible for the measured transitions. As expected, the *A* constant of the ground state is less accurately determined than the *B* and *C* constants. The rotational constants of the vibrational satellites were calculated from the three best separated and modulated lines observed in the spectrum.

Owing to the low Stark effect we could not determine the dipole moment.

Rough estimates yielded the following values for the intensity ratio of the vibrational satellites to the ground state at 24°C: 0.41 for $v_1=1$, 0.23 for $v_2=1$ and 0.15 for $v_3=1$. From these data the energy differences were calculated to be 184 cm^{-1}, 303 cm^{-1}, and 392 cm^{-1}, respectively. Un-

Table 3. Rotational constants and principal moments of inertia[a] of thiete 1,1-dioxide in the ground state.

Rotational constants	Value MHz		Principal moment of inertia	Value amu Å^2	$\varkappa$
A	5463.98	(0.59)[b]	I_a	92.492	-0.8768
B	3052.679	(0.006)	I_b	165.552	
C	2894.365	(0.006)	I_c	174.607	

[a] Conversion factor 505 377 MHz amu Å^2. [b] Values in parentheses are standard deviations determined by the least squares fitting procedure.

Table 4. Rotational constants of thiete 1,1-dioxide in vibrationally excited states.

	Value MHz			
Rotational constants	$v_1 = 1$	$v_1 = 2$	$v_2 = 1$	$v_3 = 1$
A	5465.6	5457.7	5460.4	5465.0
B	3051.76	3050.67	3055.42	3021.02
C	2894.24	2893.54	2891.35	2891.98

fortunately, there are no reliable far IR data available at present for comparison.

Assuming that the two oxygen and the two out-of-plane hydrogen atoms lie perpendicularly to the plane of the ring, which also contains the two other hydrogen atoms, we attempted to obtain an improved estimate of the distance between the oxygen atoms. Neglecting the vibrational contribution to the effective second moments of inertia [4] we obtain:

$$I_a + I_c - I_b = 2\sum_i m_i b_i^2$$

where b_i is the distance of the i:th atom from the ac plane and m_i its mass.

If the C – H bond length and the H – C – H angle are assumed to be 1.089 Å and 112.5° the distance, r_{pO}, between the plane of the ring and the oxygen atoms calculated by the above formula will be 1.239 Å. The error in r_{pO} caused by neglecting the vibrational contribution and the use of assumed values for the parameters of the hydrogen atoms has been estimated to be less than 0.01 Å.

The value obtained for r_{pO} corresponds either to an increase in the S – O bond length to 1.487 or to an increase in the O – S – O angle to 120.1° as compared to Lowenstein's values (*cf.* Table 1). A lengthening of the S – O bond to 1.49 Å appears unreasonable, whereas a value of 120° for the O – S – O angle can be considered normal.[5]

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