Raman Spectrum of CH_3TeH

By CHARLES W. SINK† and ALBERT B. HARVEY*

(*Naval Research Laboratory, Washington, D.C.* 20390)

Summary The Raman spectrum of methanetellurol prepared by a method similar to that used for methaneselenol, shows the molecule to be a near-symmetric top.

A SURVEY of the literature revealed a few isolated reports on vibrational spectra of organotellurium[1,2] compounds and except for hydrogen telluride[3,4] there have been virtually no spectra reported for tellurium hydride molecules. The synthesis of methanetellurol was reported[5] some years ago but the work has not been extensively repeated. Since this synthesis is rather involved, we chose to produce the material in a manner similar to that used in the synthesis of the selenium analogue.[6]

---

† NAS-NRC Postdoctoral Research Fellow.

Methanetellurol is a liquid with an obnoxious, persistent odour and it is probably colourless, although all of our samples were yellow. This colour is no doubt caused largely by the deep-red colour of dimethyl ditelluride which is formed by the decomposition of the tellurol. The material appears to be stable at dry ice or liquid nitrogen temperatures but decomposes readily upon warming. This decomposition is especially apparent when the sample is irradiated at room temperature with the 632·8 nm. laser source of a Cary 81 Raman Spectrophotometer. In order to reduce the formation of bubbles due to decomposition in the laser beam, the samples, which were sealed in Pyrex capillaries, were cooled by a stream of nitrogen gas that had been precooled by passing the gas through liquid nitrogen. The decomposition seems to follow two paths: one in which dimethyl ditelluride and hydrogen are formed and the other, which occurs mainly in the gas phase, where CH_4, higher organics, H_2, and a Te mirror are formed.

The Raman spectrum of methanetellurol, as expected, shows a marked correspondence to that of MeSeH[7] and the methyl group vibrational frequencies are akin to those of Me_2Te[1] and $(MeTe)_2$.[2] Since the molecule is expected to possess C_s symmetry as in the case of MeSeH,[7] MeSH,[8] and MeOH,[9] the twelve normal vibrations are divided into eight A' and four A'' modes, depending on whether the motions are parallel or perpendicular to the plane of symmetry, respectively. The molecule is a near-symmetric top; consequently, the perpendicular bands that are analogous to those of MeI arise from oscillating dipole moments lying, at least approximately, perpendicular to the C–Te bond and either parallel or perpendicular to the plane of symmetry, and consist of two nearly degenerate bands. Although the splitting of the two components may be seen in the i.r. spectra, the corresponding Raman lines are weak and broad and hence show no splitting. If these perpendicular bands are considered to consist of one feature containing two degenerate components, then eleven of the twelve fundamentals of methanetellurol are observed in the Raman spectrum (the torsional vibration was not observed in the Raman effect). The observed Raman shifts and their assignments, which were obtained by comparison with the assignments for MeSeH,[7] MeSH,[8] Me_2Te,[1] $(MeTe)_2$[2] and related molecules, appear in the Table.

TABLE

Raman spectrum of methanetellurol[a]

Δν (cm.$^{-1}$)	Relative intensity	Depolarization	Assignment
516	vs	p	C–Te stretch
608	w	p?	C–Te–H bend
≈870[b]	vvvw	–	CH_3 rock
1220	m	p	CH_3 symmetric deformation
1417[b]	vvw (bd)	–	CH_3 antisymmetric deformation
2016	s	p	Te–H stretch
2931	s	p	CH_3 symmetric stretch
3019[b]	vw (bd)	–	CH_3 antisymmetric stretch

[a] s, m, w, v, p, and bd denote: strong, medium, weak, very, polarized, and broad, respectively.

[b] Intensity too weak to obtain depolarization value.

(*Received, May* 16*th*, 1969; *Com.* 688.)

[1] J. R. Allkins and P. J. Hendra, *Spectrochim. Acta*, 1966, **22**, 2075.
[2] C. W. Sink and A. B. Harvey, *J. Mol. Structure*, in the press.
[3] K. Rossman and J. W. Straley, *J. Chem. Phys.*, 1956, **24**, 1276.
[4] R. A. Hill and T. H. Edwards, *J. Mol. Spectroscopy*, 1964, **14**, 221.
[5] A. Baroni, *Atti. Accad. naz. Lincei, Rend. Classe Sci. fis., mat. nat.*, 1938, **27**, 238.
[6] G. E. Coates, *J. Chem. Soc.*, 1953, 2839.
[7] A. B. Harvey and M. K. Wilson, *J. Chem. Phys.*, 1966, **45**, 678.
[8] T. Kojima, *J. Phys. Soc. Japan*, 1960, **15**, 1284.
[9] D. Burkhard and D. M. Dennison, *J. Mol. Spectroscopy*, 1959, **3**, 299.
[10] T. Kojima, E. Breig, and C. Lin, *J. Chem. Phys.*, 1961, **35**, 2139.