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# AMINOARYLTELLURIUM(IV) TRIHALIDES

FRANK J. BERRY

Department of Chemistry, University of Birmingham,
P. O. Box 363, Birmingham B15 2TT (Great Britain)

AND A. K. GUPTA, B. L. KHANDELWAL AND K. RAINA

Department of Chemistry, Indian Institute of Technology,
New Delhi (India)

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## SUMMARY

The preparation and properties of some aminoaryltellurium(IV) trihalides are reported. Conductivity measurements show the compounds to behave as 1:1 electrolytes when in dilute solution. Cryoscopic measurements reflect the molecular, and sometimes polymeric, nature of the materials in more concentrated solutions. The $^1$H nmr and infrared spectra are discussed.

## INTRODUCTION

Although the preparation and properties of aryltellurium compounds are now well established, the only amino substituted aryltellurium(IV) derivatives which have been reported are the

1-N,N dimethylaniline-4-tellurium(IV)-dichloride [1] and -trihalides [2]. This work reports the formation of the aniline-; o-toluidine-;p-toluidine-;2,4-dimethylaniline-;2,6-dimethylaniline-; and monomethylaniline-tellurium(IV) trihalides and describes some physical and spectroscopic studies of their properties.

## EXPERIMENTAL

The aminoaryltellurium(IV) trihalides were prepared from either the aminehydrogenhexahalotellurates, $(AmH)_2TeX_6$, (Am=amine, X= halogen) or the amine tellurium tetrahalide adduct $2Am.TeX_4$, in methanolic solution [2]. Analytical data are summarised in Table 1.

Conductance measurements were performed under dry conditions at 30 ± 1°C using a conductance bridge and dip type cell with a smooth platinum electrode.

Molecular weights were determined cryoscopically in nitrobenzene.

$^1H$ nmr spectra were recorded in d-acetone or d-acetonitrile using tetramethylsilane as an internal reference.

## RESULTS AND DISCUSSION

The formation of aminoaryltellurium(IV) trihalides from the $2Am.TeX_4$ adducts involves electrophilic substitution of the aromatic ring by tellurium(IV). Substitution occurs at the para position unless it is otherwise occupied. The formation from hexahalotellurates suggests that these species dissociate into the amine and tellurium tetrahalide in methanolic solution.

The aminoaryltellurium(IV) trihalides, $RTeX_3$ are crystalline solids which are fairly stable in dry air, but are hydrolysed

in the order Cl>Br>I to tellurium dioxide, aminohydrogen halide and halogen acid. No intermediate products of the type $RTe(OH)X_2$, $RTe(OH)_2X$ or RTe(O)X were isolated as is observed during the hydrolyses of unsubstituted aryltellurium(IV) trihalides [3]. The breakdown of the tellurium-carbon bond in the aminoaryltellurium(IV) trihalides is presumably a result of the initial facile formation of the aminohydrogen halide and halogen acid.

The compounds are soluble in solvents of high dielectric constant but are insoluble in non polar solvents.

The molar conductances of some of the aminoaryltellurium(IV) trihalides in acetone, acetonitrile and nitrobenzene solution are recorded in Table 2.

The values increase with dilution but lie within or close to the expected [4] ranges for 1:1 electrolytes containing ca. $10^{-3}$M of solute and reflect the likely formation in dilute solution of $RTeX_2^+$ and $X^-$ ions. Such behaviour is different from that of the unsubstituted aryltellurium(IV) trichlorides which do not dissociate in solution [5] and is due to the more polar character of the material containing an amine group. It has been noted [4] that the concentration ranges selected for such measurements are often arbitarily chosen and that the method of determination requires the assumption of a molecular weight which may be erroneous. Those aminoaryltellurium(IV) tribromides and triiodides which were sufficiently soluble ($>10^{-3}$g eq $l^{-1}$) in acetonitrile were therefore investigated over a wider concentration range and the results subjected to the Onsager Law. Values of the equivalent conductance at infinite dilution, $\Lambda_o$, and $(\underline{A} + \omega \underline{B} \Lambda_o)$ are recorded in Table 3. A comparison of calculated and experimental values of $(\underline{A} + \omega \underline{B} \Lambda_o)$ show the compounds to behave as 1:1 electrolytes. The experimental

TABLE 1

ANALYTICAL DATA FOR NEW COMPOUNDS

| Compound | Found (%) C | H | N | Hal | Te | Molecular formula | Calcd (%) C | H | N | Hal | Te |
|---|---|---|---|---|---|---|---|---|---|---|---|
| anilinetellurium | | | | | | | | | | | |
| -trichloride | 22.00 | 1.78 | 4.27 | 32.44 | 38.45 | $C_6H_6NCl_3Te$ | 22.15 | 1.84 | 4.31 | 32.76 | 39.07 |
| -tribromide | 16.12 | 1.56 | 2.96 | 52.06 | 27.21 | $C_6H_6NBr_3Te$ | 15.66 | 1.30 | 3.04 | 52.22 | 27.76 |
| -triiodide | | | | 63.03 | 21.06 | $C_6H_6NI_3Te$ | 11.98 | 1.00 | 1.33 | 63.44 | 21.24 |
| o-toluidinetellurium | | | | | | | | | | | |
| -trichloride | | | 4.38 | 29.62 | 36.60 | $C_7H_8NCl_3Te$ | 24.70 | 2.35 | 4.13 | 31.34 | 37.46 |
| -tribromide | 18.09 | 1.86 | | 50.30 | 26.41 | $C_7H_8NBr_3Te$ | 17.73 | 1.69 | 2.95 | 50.67 | 26.94 |
| -triiodide | | | 2.26 | 61.23 | 20.50 | $C_7H_8NI_3Te$ | 13.67 | 1.30 | 2.28 | 62.00 | 20.76 |
| p-toluidinetellurium | | | | | | | | | | | |
| -trichloride | | | 4.46 | 29.77 | 37.92 | $C_7H_8NCl_3Te$ | 24.70 | 2.35 | 4.13 | 31.34 | 37.46 |
| -tribromide | | | 2.88 | 51.80 | 26.36 | $C_7H_8NBr_3Te$ | 17.73 | 1.69 | 2.95 | 50.67 | 26.94 |
| -triiodide | 13.98 | 1.72 | | 61.56 | 20.62 | $C_7H_8NI_3Te$ | 13.67 | 1.30 | 2.28 | 62.00 | 20.76 |
| 2,4-dimethylaniline--tellurium | | | | | | | | | | | |
| -trichloride | | | 3.52 | 30.60 | 36.08 | $C_8H_{10}NCl_3Te$ | 27.20 | 2.83 | 3.96 | 30.17 | 35.97 |
| -tribromide | | | 2.89 | 48.49 | 25.92 | $C_8H_{10}NBr_3Te$ | 19.69 | 2.05 | 2.87 | 49.22 | 26.17 |
| -triiodide | 14.87 | 1.15 | | 60.55 | 20.23 | $C_8H_{10}NI_3Te$ | 15.27 | 1.59 | 2.23 | 60.61 | 20.30 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2,6-dimethylaniline- | | | | | | | | | | | |
| -tellurium | | | | | | | | | | | |
| -trichloride | 27.10 | 2.80 | 3.71 | 30.20 | 36.00 | $C_8H_{10}NCl_3Te$ | 27.20 | 2.83 | 3.96 | 30.17 | 35.97 |
| -tribromide | 19.15 | 2.79 | | 48.86 | 25.82 | $C_8H_{10}NBr_3Te$ | 19.69 | 2.05 | 2.87 | 49.22 | 26.17 |
| -triiodide | | | | 60.58 | 20.14 | $C_8H_{10}NI_3Te$ | 15.27 | 1.59 | 2.23 | 60.61 | 20.30 |
| methylaniline- | | | | | | | | | | | |
| -tellurium | | | | | | | | | | | |
| -trichloride | | | 4.12 | 30.87 | 36.98 | $C_7H_8NCl_3Te$ | 24.70 | 2.35 | 4.13 | 31.34 | 37.46 |
| -tribromide | 17.46 | 1.55 | 3.07 | 50.26 | 26.30 | $C_7H_8NBr_3Te$ | 17.73 | 1.69 | 2.95 | 50.67 | 26.94 |
| -triiodide | 13.69 | 1.71 | 2.23 | 62.06 | 20.40 | $C_7H_8NI_3Te$ | 13.67 | 1.30 | 2.28 | 62.00 | 20.76 |

TABLE 2

NOLAR CONDUCTANCE DATA FOR AMINOARYLTELLURIUM(IV) TRIHALIDES

| Aminoaryl Group | ACETONITRILE | | NITROBENZENE | | ACETONE | |
|---|---|---|---|---|---|---|
| | Molar Concentration $cX10^3$ mol $l^{-1}$ | Molar Conductance $\Lambda_M$ $ohm^{-1}cm^2$ $mol^{-1}$ | Molar Concentration $cX10^3$ mol $l^{-1}$ | Molar Conductance $\Lambda_M$ $ohm^{-1}cm^2$ $mol^{-1}$ | Molar Concentration $cX10^3$ mol $l^{-1}$ | Molar Conductance $\Lambda_M$ $ohm^{-1}cm^2$ $mol^{-1}$ |
| TRICHLORIDES | | | | | | |
| aniline | 2.0 | 114.1 | | | 1.0 | 100.2 |
| | 1.6 | 116.1 | | | 0.5 | 106.7 |
| | 1.0 | 124.1 | | | 0.25 | 128.5 |
| | 0.5 | 137.3 | | | | |
| o-toluidine | 1.0 | 84.8 | | | 1.0 | 102.8 |
| | 0.5 | 99.1 | | | 0.5 | 114.4 |
| | 0.25 | 119.8 | | | 0.25 | 120.5 |
| p-toluidine | 1.0 | 79.7 | | | 1.0 | 106.0 |
| | 0.5 | 98.5 | | | 0.5 | 110.6 |
| | 0.25 | 108.0 | | | 0.25 | 116.5 |
| 2,4-dimethylaniline | 1.0 | 87.7 | | | | |
| | 0.25 | 106.4 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2,6-dimethylaniline | 1.0 | 90.5 | | | | |
| | 0.25 | 111.2 | | | | |
| methylaniline | 1.0 | 115.2 | | | 1.0 | 106.8 |
| | 0.25 | 135.1 | | | 0.25 | 121.3 |
| 1-N,N-dimethylaniline | 1.0 | 86.8 | 1.5 | 16.5 | 1.6 | 100.2 |
| | 0.25 | 97.9 | 1.0 | 18.0 | 1.0 | 106.7 |
| | 0.10 | 117.3 | 0.5 | 19.5 | 0.25 | 128.5 |
| TRIBROMIDES | | | | | | |
| aniline | 2.0 | 146.3 | 3.0 | 25.2 | 2.1 | 128.8 |
| | 1.0 | 163.0 | 2.4 | 26.1 | 1.6 | 131.8 |
| | | | 1.2 | 27.5 | 1.1 | 136.6 |
| O-toluidine | 2.6 | 142.4 | 1.0 | 21.8 | 2.0 | 125.9 |
| | 1.0 | 149.0 | 0.8 | 24.3 | 1.5 | 128.4 |
| | | | 0.5 | 29.9 | 1.0 | 130.6 |
| p-toluidine | 2.0 | 140.3 | 1.0 | 27.5 | 3.0 | 123.6 |
| | 1.0 | 143.8 | 0.8 | 26.7 | 2.0 | 126.4 |
| | | | 0.5 | 31.1 | 1.0 | 129.7 |
| 2,4-dimethylaniline | 2.0 | 139.7 | 1.0 | 19.2 | 0.5 | 130.6 |
| | 1.0 | 148.6 | 0.6 | 24.0 | 0.3 | 135.2 |
| | | | 0.2 | 27.0 | 0.1 | 142.8 |

Table 2 continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 2,6-dimethylaniline | 2.8 | 137.1 | 1.0 | 18.6 | 0.5 | 132.1 |
| | 1.8 | 141.7 | 0.6 | 23.0 | 0.3 | 136.6 |
| | | | 0.2 | 27.0 | 0.1 | 142.8 |
| methylaniline | 2.0 | 145.5 | 2.3 | 27.6 | 3.0 | 118.4 |
| | 1.0 | 166.3 | 1.8 | 28.3 | 2.0 | 121.6 |
| | | | 1.0 | 29.5 | 1.0 | 125.0 |
| 1-N,N-dimethylaniline | 2.0 | 127.0 | 1.5 | 18.3 | 1.5 | 102.0 |
| | 1.0 | 140.9 | 1.0 | 24.3 | 1.0 | 114.0 |
| | | | 0.5 | 28.3 | 0.5 | 120.4 |
| TRIIODIDES | | | | | | |
| aniline | 1.0 | 126.0 | 1.0 | 22.2 | 0.5 | 120.0 |
| | 0.8 | 130.0 | 0.6 | 26.0 | 0.3 | 148.0 |
| | 0.6 | 140.0 | 0.2 | 30.6 | 0.1 | 160.0 |
| o-toluidine | 5.0 | 116.0 | 1.0 | 21.0 | 1.0 | 120.0 |
| | 1.0 | 132.0 | 0.6 | 25.0 | 0.5 | 138.0 |
| | 0.5 | 144.0 | 0.2 | 28.2 | 0.1 | 168.0 |
| p-toluidine | 1.0 | 132.0 | 1.0 | 19.8 | 1.0 | 114.0 |
| | 0.6 | 150.0 | 0.6 | 23.8 | 0.6 | 140.0 |
| | 0.2 | 162.0 | 0.2 | 27.0 | 0.2 | 153.0 |

Table 2 continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 2,4-dimethylaniline | 0.5 | 140.0 | 0.5 | 26.4 | 0.1 | 132.0 |
| | 0.3 | 152.0 | 0.3 | 30.0 | 0.08 | 157.5 |
| | 0.1 | 168.0 | 0.1 | 36.0 | 0.06 | 180.0 |
| 2,6-dimethylaniline | 0.5 | 134.0 | 0.4 | 25.2 | 0.1 | 126.0 |
| | 0.3 | 138.0 | 0.3 | 30.0 | 0.08 | 142.5 |
| | 0.1 | 144.0 | 0.1 | 35.4 | 0.06 | 170.0 |
| methylaniline | 2.0 | 133.9 | 1.5 | 22.3 | 1.0 | 114.5 |
| | 1.0 | 143.2 | 1.0 | 25.8 | 0.8 | 120.3 |
| | | | 0.5 | 28.2 | 0.5 | 130.6 |
| 1-N,N-dimethylaniline | 1.5 | 120.5 | 1.5 | 21.1 | 1.0 | 109.0 |
| | 1.0 | 130.2 | 1.0 | 24.5 | 0.8 | 112.7 |
| | 0.5 | 138.1 | 0.5 | 27.1 | 0.5 | 118.2 |

TABLE 3

VALUES OF $(\Lambda_o + \omega\beta\Lambda_o)$ FOR AMINOARYLTELLURIUM(IV)-TRIBROMIDES AND TRIIODIDES IN ACETONITRILE

| Compound | $\Lambda_o$ ($ohm^{-1}$) | $(\Lambda_o+\omega\beta\Lambda_o)$ Calcd. | $(\Lambda_o+\omega\beta\Lambda_o)$ Found | Ratio (Found/Calcd) |
|---|---|---|---|---|
| TRIBROMIDES | | | | |
| aniline | 150 | 342.8 | 468.0 | 1.36 |
| o-toluidine | 161 | 350.8 | 418.0 | 1.19 |
| p-toluidine | 159 | 349.4 | 529.4 | 1.43 |
| 2,4-dimethylaniline | 155 | 346.5 | 382.3 | 1.10 |
| 2,6-dimethylaniline | 163 | 352.3 | 500.0 | 1.42 |
| methylaniline | 153 | 345.0 | 479.2 | 1.39 |
| 1-N,N dimethylaniline | 153 | 345.0 | 578.0 | 1.67 |
| TRIIODIDES | | | | |
| methylaniline | 152 | 344.2 | 400.0 | 1.16 |
| 1-N,N dimethylaniline | 167 | 355.2 | 459.0 | 1.29 |

values of ($\underline{A} + \omega \underline{B} \underline{\Lambda}_0$) do not approach those calculated for 1:2 electrolytes. The ratios which were found to be higher than expected may reflect incomplete dissociation or ion pair formation as observed during similar studies of the tetra-alkylammonium halide [6].

The molecular weights of aminoaryltellurium(IV) trihalides in nitrobenzene are given in Table 4.

The low molecular weights of the compounds in concentrations below 10 mmol $l^{-1}$ are consistent with the dissociation of the compounds as described by the conductance data at even lower concentrations. At higher concentrations the molecular weights resemble the formula weights and suggest that the materials exist in the molecular form. The solubility of compounds of the type $RTeX_3$ (where R = $C_6H_4N(H)CH_3$, $C_6H_4N(CH_3)_2$, X = Cl, Br,I) is appreciable and the measurements indicate the formation of polymeric species in solution as has been observed in the methyltellurium(IV) trihalides [7,8]. It seems that the electron donating effect of methyl groups in aminoaryltellurium(IV) trihalides produces maximum solubility when the methyl groups are attached to the nitrogen atom by optimising the polar nature of the materials. Compounds in which the methyl group on the aromatic ring are in positions which are not *para* to the tellurium trihalide are markedly less soluble to the extent that for some compounds the molecular weights could not be determined.

The order of solubility of 1-N,N dimethylaniline-4-tellurium trihalides in nitrobenzene is Cl>I>Br and follows the trend in solubility of the phenyltellurium trihalides in benzene [9]. The solubility of the other aminoaryltellurium(IV) trihalides is in the order Cl>Br>I which corresponds with the trend observed for methyl-tellurium(IV) trihalides [7].

TABLE 4

CRYOSCOPIC MEASUREMENTS OF AMINOARYTELLURIUM(IV) TRIHALIDES IN NITROBENZENE

| Compound | Formula Weight | Concentration mmol $l^{-1}$ | Molecular Weight |
|---|---|---|---|
| TRICHLORIDES | | | |
| aniline | 325.5 | 4.93 | 275 |
| | | 7.12 | 309 |
| | | 9.11 | 323 |
| | | 10.93 | 356 |
| | | 14.94 | 365 |
| | | 18.20 | 374 |
| o-toluidine | 339.5 | 2.19 | 223 |
| | | 4.03 | 274 |
| | | 5.98 | 304 |
| | | 7.63 | 311 |
| | | 10.03 | 340 |
| 2,4-dimethylaniline | 353.5 | 2.10 | 223 |
| | | 2.84 | 241 |
| | | 3.93 | 278 |
| | | 4.98 | 302 |
| | | 6.16 | 327 |
| 2,6-dimethylaniline | 353.5 | 2.06 | 219 |
| | | 2.63 | 223 |
| | | 3.01 | 256 |
| | | 4.23 | 299 |
| | | 5.06 | 307 |
| methylaniline | 339.5 | 5.12 | 298 |
| | | 11.70 | 341 |
| | | 15.74 | 356 |
| | | 21.08 | 373 |
| | | 23.97 | 391 |
| | | 25.96 | 407 |
| 1-N,N-dimethylaniline | 353.5 | 24.38 | 350 |
| | | 25.56 | 345 |
| | | 28.73 | 347 |
| | | 39.79 | 355 |
| | | 49.80 | 355 |
| | | 51.05 | 413 |
| | | 55.36 | 587 |
| | | 59.69 | 703 |

Table 4 continued

| | | | |
|---|---|---|---|
| TRIBROMIDES | | | |
| aniline | 459 | 4.69 | 323 |
| | | 7.44 | 410 |
| | | 9.30 | 427 |
| | | 10.49 | 444 |
| | | 11.82 | 465 |
| o-toluidine | 473 | 4.36 | 307 |
| | | 6.39 | 363 |
| | | 8.32 | 393 |
| | | 10.05 | 407 |
| p-toluidine | 473 | 2.44 | 244 |
| | | 4.11 | 308 |
| | | 5.45 | 327 |
| | | 6.53 | 356 |
| methylaniline | 473 | 4.94 | 351 |
| | | 11.26 | 456 |
| | | 15.41 | 486 |
| | | 20.07 | 518 |
| 1-N,N-dimethylaniline | 487 | 20.63 | 480 |
| | | 21.60 | 485 |
| | | 22.53 | 468 |
| | | 34.67 | 482 |
| | | 40.16 | 521 |
| | | 43.15 | 712 |
| | | 45.80 | 942 |
| TRIIODIDES | | | |
| methylaniline | 614 | 3.95 | 485 |
| | | 5.04 | 530 |
| | | 6.81 | 558 |
| | | 8.62 | 577 |
| | | 10.65 | 617 |
| | | 13.42 | 659 |
| 1-N,N-dimethylaniline | 628 | 37.85 | 620 |
| | | 38.15 | 585 |
| | | 39.96 | 621 |
| | | 50.21 | 626 |
| | | 50.92 | 868 |
| | | 51.83 | 1109 |
| | | 53.40 | 1242 |

TABLE 5

$^1$H NMR CHEMICAL SHIFTS FOR ARYL PROTONS

| Compound | Solvent | $\delta_\alpha$ ppm | $\delta_\beta$ ppm |
|---|---|---|---|
| anilinetellurium-trichloride | d-acetone | 7.57 | |
| -tribromide | " | 7.65 | |
| -triiodide | " | 8.34 | |
| 1-N,N-dimethylanilinetellurium-trichloride | d-acetonitrile | 7.63 | 7.54 |
| -tribromide | " | 7.61 | 7.50 |
| -triiodide | " | 7.24 | 6.96 |
| di-p-tolyltellurium(IV)-dichloride | carbon tetrachloride | 8.17 | 7.47 |
| -dibromide | " | 8.17 | 7.41 |
| -diiodide | " | 8.06 | 7.26 |

$^1$H nmr spectra of aminoaryltellurium(IV) trihalides showed the aryl proton signals to resonate at lower field than in the parent amines and reflect the deshielding effect of the electron withdrawing tellurium trihalide group. The 1-N,N dimethylanilinetellurium(IV) trihalides gave AA'BB' spectra characteristic of 1,4-disubstituted rings whilst the other compounds gave either broad lines or complex multiplets. The 1-N,N dimethylaniline-4-tellurium(IV) trihalides which were found to be largely associated in solution showed the deshielding of the aryl proton signals (Table 5) to follow the order Cl>Br>I which reflects the electron withdrawing effect of the more electronegative ligands and corresponds with the trend observed for the soluble diphenyltellurium(IV) dihalides. The aryl proton signals in the less soluble aminoaryltellurium(IV) trihalides showed the order of deshielding to be I>Br>Cl. Presumably the greater deshielding in the less soluble triiodide results from the retention of a higher degree of positive charge by the $RTeI_2^+$ cation.

The far infrared data for some of the aminoaryltellurium trihalides are given in Table 6 and show good agreement with those reported for the phenyltellurium(IV) trihalides [9]. The absence of lattice absorption indicates the unlikely ionic formulation $ArTeX_2^+ X^-$ in the solid state. The spectra are consistent with the assignation attibuted to the phenyltellurium(IV) trihalides as polymeric species involving halide bridges between the tellurium atoms [9]. The bands have been ascribed to Te-C, Te-halogen (terminal) and Te-halogen (bridge) stretching frequencies and Te-halogen deformation vibrations. The N-H stretching frequency remains unchanged on forming the aminoaryl-tellurium(IV) trihalide from the parent compound and confirms that linkage of the tellurium is to a carbon atom in the aromatic ring rather than the nitrogen atom of the amine group.

TABLE 6

FAR INFRARED DATA FOR AMINOARYLTELLURIUM(IV) TRIHALIDES

| | aniline $cm^{-1}$ | o-toluidine $cm^{-1}$ | p-toluidine $cm^{-1}$ | 2,4-dimethylaniline $cm^{-1}$ |
|---|---|---|---|---|
| TRICHLORIDES | 375(sb) | 320(mb) | | 340(sb) |
| | 232(s)<br>200(sh) | | | |
| | 168(mb)<br>145(m) | | | |
| TRIBROMIDES | 365(wb) | 357(wb) | 278(wb) | 263(w)<br>255(m) |
| | 185(vs) | 187(vs) | 192(vs) | 188(vs) |
| | 147(m)<br>109(sh) | 150(sh)<br>104(m) | 145(sh)<br>112(sh) | 152(sh)<br>118(sh) |
| TRIIODIDES | 280(wb) | 280(vw) | 276(vw) | 273(vw) |
| | 151(sh)<br>140(sb)<br>130(sb) | 152(mb)<br>141(sb) | 140(mb) | 138(sb) |
| | 105(wb) | 116(w) | 115(w) | 115(wo) |

## REFERENCES


1. G. T. Morgan and H. Burgess, J. Chem. Soc., 1929, 1103
2. A. K. Gupta, B. L. Khandelwal, and K. Raina, J. Inorg. Nucl. Chem., 1977, 39, 162
3. P. Thavornyutikarn and W. R. McWhinnie, J. Organometallic Chem., 1973, 50, 135
4. W. J. Geary, Coord. Chem. Revs., 1971, 7, 81
5. K. J. Wynne, A. J. Clark and M. Beorg, J. Chem. Soc (Dalton), 1972, 2370
6. A. C. Harkness and H. M. Daggett, Can. J. Chem., 1965, 43 1215

| 2,6-dimethylaniline $cm^{-1}$ | methylaniline $cm^{-1}$ | 1-N,N-dimethylaniline $cm^{-1}$ | Assignation |
|---|---|---|---|
| 328(sh)<br>326(s) | 321(wb) | 336(sb)<br>330(sb)<br>325(sb) | $\nu$ Te-Cl terminal |
| | 242(s)<br>200(s) | 227(sb) | $\nu$ Te-C |
| | 177(sh)<br>150(sh) | 150(sh) | $\nu$ Te-Cl bridge |
| 269(sh)<br>245(wb) | 221(sh) | 238(wb) | $\nu$ Te-C |
| 187(vs) | | | |
| | 180(vs) | 189(s) | $\nu$ Te-Br terminal |
| 150(sh)<br>115(sh) | 145(sh)<br>120(w) | 145(sh)<br>110(w) | $\nu$ Te-Br bridge |
| 286(vw) | 280(wb) | 273(vw) | $\nu$ Te-C |
| 151(sh) | | | |
| 140(sb) | 145(vs) | 157(s) | $\nu$ Te-I terminal |
| 112(vw) | 100(m) | 108(m) | $\nu$ Te-I bridge |


7. K. J. Wynne and P. S. Pearson, Inorg. Chem., 1970, 9, 106

8. M. T. Chen and J. W. George, J. Amer. Chem. Soc., 1968, 90, 4580

9. W. R. McWhinnie and P. Thavornyutikarn, J. Chem. Soc.(Dalton), 1972, 551