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Synthesis, Characterization, and Solution Properties of Some New Organotellurium Compounds Based on Di(cyclohexylmethyl)telluride

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ABSTRACT: *A new series of organotellurium(IV) compounds based on di(cyclohexylmethyl)telluride (**1**) (i.e., $(C_6H_{11}CH_2)_2TeX_2$ and $(C_6H_{11}CH_2)_2Te(R)X$) was prepared by the reaction of compound **1** with halogens, N-bromosuccinimide, and alkyl halides. Phenylation of $(C_6H_{11}CH_2)_2TeX_2$ with sodium tetraphenylborate gave di(cyclohexylmethyl)phenyltelluronium tetraphenylborate in good yield. Conductivity measurements in dimethylsulfoxide (DMSO) showed a considerable ionic character of these compounds and they behave as 1:1 electrolytes. ^1H NMR studies in $CDCl_3$ solution indicated that telluronium salts employed in this study are unstable toward reductive elimination. Reaction of di(cyclohexylmethyl)telluride, $(C_6H_{11}CH_2)_2Te(CH_3)I$, and $(C_6H_{11}CH_2)_2Te(PhCH_2)Br$ with HgX_2 (X = Cl or Br) afforded 1:1 complexes. All compounds were characterized by elemental analyses and spectroscopic data.* © 2007 Wiley Periodicals, Inc. Heteroatom Chem 18:93–99, 2007; Published online in Wiley InterScience (www.interscience.wiley.com). DOI 10.1002/hc.20240

INTRODUCTION

Telluronium salts of type $Ph_2Te(CH_3)X$ (where X = Cl, Br, I, NCS, PhCOO) reductively eliminate CH_3X in solvents such as chloroform and DMF. The rates of reductive elimination depended on the nature of ionic group X [1–4]. Furthermore, it was observed that methylation and demethylation equilibration in dimethylsulfoxide (DMSO) is reversible for methyltelluronium salts [5]. Our previous studies of heterocyclic telluronium salts showed that they are stable toward reductive elimination in $CHCl_3$, DMSO, and DMF solutions [4,6–9]. On the other hand, telluronium salts based on 2,2,6,6-tetramethyl-1-oxa-4-tellura-2,6-disilacyclohexane-containing benzyl or allyl groups reductively eliminated benzyl or allyl halides in $CHCl_3$ solutions [10], while methyl and ethyltelluronium salts were stable to reductive elimination [10].

In this work, we report the synthesis, solution properties, and ligand properties for a new series of previously unreported organotellurium(IV) compounds based upon di(cyclohexylmethyl)telluride. Furthermore, we will examine their stabilities toward the reductive elimination in $CDCl_3$ solution in order to gain further information about their behavior in solution.

RESULTS AND DISCUSSION

The reaction of sodium telluride (prepared in situ from tellurium powder and $NaBH_4$ in aqueous NaOH solution) with bromomethylcyclohexane gave di(cyclohexylmethyl)telluride (**1**) as foul-smelling yellow heavy oil in moderate yield. Compound **1** is soluble in common organic solvents and deposits

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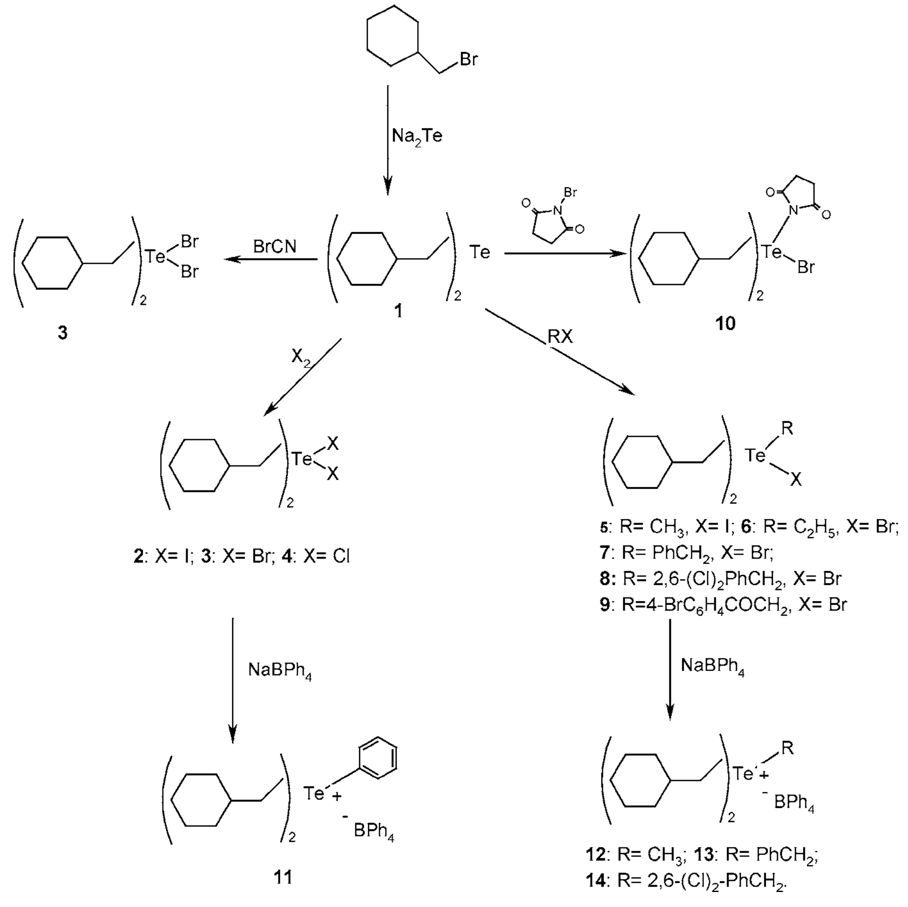


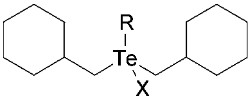
SCHEME 1 Preparative methods for compounds **1–14**.

elemental tellurium during storage in a refrigerator for 2–3 days. Treatment of compound **1** with iodine, bromine, and chlorine in diethyl ether gave the diiodo-, dibromo-, and dichlorotellurium(IV) compounds **2, 3**, and **4**, respectively, in good yields (Scheme 1). It is worth noting that the reaction of cyanogen bromide with compound **1** unexpectedly gave dibromo derivative **3** instead of di(cyclohexylmethyl)cyanotellurium bromide (Scheme 1). This is in contrast to previously reported works [4,11,12], and suggests that cyanogen bromide can be used as a brominating agent in such reactions. A ^{13}C NMR spectrum of compound **3**, which was prepared by reacting compound **1** with BrCN, did not show a signal corresponding to C=O (Table 1). It was also found that compound **1** readily reacted with *N*-bromosuccinimide to form compound **10** (Scheme 1, Table 1). This result agrees well with previous works [4,13]. Compound **1** can be easily oxidized to telluronium salts with alkyl halides such as CH_3I and C_2H_5Br, benzyl bromide, 2,6-dichlorobenzyl bromide, and 4-bromophenacyl bromide to form compounds **5, 6, 7, 8**, and **9**, respectively, in good yields (Scheme 1).

Phenylation of compound **3** was carried out in methanol using $NaBPh_4$ as phenylating agent and generated compound **11** in 51% yield (Scheme 1). Anion exchange using compounds **5, 7**, and **8** as starting materials gave the corresponding telluronium salts containing the tetraphenylborate anion, that is, compounds **12, 13**, and **14**, respectively (Scheme 1). All reactions yielded pure compounds after one recrystallization.

Molar conductivities of these compounds were obtained in DMSO solution. Single concentration data (10^{-3} M) are shown in the "Experimental" section. The values of molar conductance approach those expected for 1:1 electrolytes [3,4,6,8]. Compounds **11, 12, 13**, and **14** have low conductivities. This may be explained by the close contact between the tellurium atom and one phenyl ring of the tetraphenylborate anion through Te–π interaction as shown by X-ray studies on other telluronium salts containing BPh_4 anions [14,15]. The low conductivity of compound **4** may be due to the association of this compound via ionic bonds in DMSO, since it is well known that association is common for organotellurium compounds [16,17]. The conductivities

TABLE 1 ^{1}H NMR Data for Di(cyclohexylmethy)telluride Derivatives in $CDCl_3$



Compound	*R*	*X*	*Chemical Shifts (ppm); TMS = 0 ppm*
1			0.7–2.0 (m, 22H, Cy—*H*); 2.55 (d, 4H, Te—CH_2—Cy).
2	I	I	1.0–2.6 (m, 22H, Cy—*H*); 3.70 (d, 4H, Te—CH_2—Cy).
3[b]	Br	Br	1.0–2.7 (m, 22H, Cy—*H*); 3.60 (d, 4H, Te—CH_2—Cy).
4	Cl	Cl	1.0–2.5 (m, 22H, Cy—*H*); 3.50 (d, 4H, Te—CH_2—Cy).
5	CH_3	I	0.8–2.1 (m, Cy—*H*); 2.55 (d[a], Te—CH_2—Cy + CH_3I ?); 3.10 (d, Te—CH_2—Cy); 3.50 (s, Te—CH_3).
6	C_2H_5	Br	0.80–2.50 (m, Cy—H + Te—CH_2—Cy + Te—CH_2—CH_3 + Br—CH_2—CH_3); 2.60–3.40 (m, Te—CH_2—Cy + Br—CH_2—CH_3).
7	$PhCH_2$	Br	1.0–1.8 (m, Cy—*H*); 2.35 (s, Te—CH_2—Ph ?); 2.55 (d, Te—CH_2—Cy); 2.76 (d, Te—CH_2—Cy ?); 4.62 (s, Br—CH_2—Ph); 7.10–7.65 (m, Ar—*H*).
8	2,6-$(Cl)_2PhCH_2$	Br	1.0–2.0 (m, Cy—*H*); 2.55 (s, Te—CH_2—Cy); 3.10 (d, Te—CH_2—Cy); 4.23 (s, Te—CH_2—Ph); 4.63 (s, Br—CH_2—Ar); 7.00–7.70 (m, Ar—*H*).
9	4-$BrPhCOCH_2$	Br	0.70–2.60 (m, Cy—*H*); 3.65 (d, Te—CH_2—Cy); 4.40 (s, ArCO—CH_2—Te); 4.63 (s, ArCO—CH_2—Br); 7.25–8.15 (m, Ar—*H*).
10	$C_4H_4O_2^c$	Br	1.0–2.6 (m, 22H, Cy—*H*); 2.97 (d, 4H, Te—CH_2—Cy); 2.85 (d, 4H,Te—CH_2—Cy); 3.37 (s, 4H, CO—CH_2).
11	C_6H_5	BPh_4	0.70–1.80 (m, 22H, Cy—*H*); 3.20 (d, 4H, Te—CH_2—Cy); 6.80–7.70 (m, 25H, Ar—*H*).
12	CH_3	BPh_4	0.70–1.90 (m, 22H, Cy—*H*); 1.10 (s, 3H, Te—CH_3); 1.95 (d, 4H, Te—CH_2—Cy); 6.70–7.60 (m, 20H, Ar—*H*).
13	$PhCH_2$	BPh_4	0.70–2.30 (m, 22H, Cy—*H*); 1.40 (d, 4H, Te—CH_2—Cy); 2.90 (s, 2H, Te—CH_2—Ph); 6.70–7.90 (m, 25H, Ar—*H*)
14	2,6-$(Cl)_2PhCH_2$	BPh_4	0.50–1.90 (m, 22H, Cy—*H*); 2.28 (d, 4H, Te—CH_2—Cy); 3.85 (s, 2H, Ar—CH_2—Te); 6.80–7.80 (m, 23H, Ar—*H*).

[a] Unsymmetrical doublet.

[b] ^{13}C NMR ($CDCl_3$) for compound **3** prepared from BrCN: 18.2, 24.2, 28.2, 33.5, 46.2.

[c] ^{13}C NMR ($CDCl_3$) for compound **10**: 19.9, 25.4, 26.7, 28.1, 28.5, 32.9, 172.3.

of compounds **3, 5, 7**, and **12** were studied as a function of concentration, that is, molar conductance (Λ_M) against $\sqrt{C}$, and the plots are typical of weak electrolytes (Fig. 1).

An infrared (IR) spectrum of compound **9** showed a strong band at 1680 cm^{-1} corresponding to ν(C=O), while compound **10** showed two strong bands at 1685 and 1765 cm^{-1} for ν(C=O).

Molecular weight determinations for compounds **1, 2**, and **3** indicated that these compounds are monomeric in benzene solution, and were found to be 323.56, 580.10, and 470.00, respectively. We were unable to determine the molecular weights of other compounds prepared in this study because of their insolubilities in benzene.

^{1}H NMR data are presented in Table 1. In the ^{1}H NMR spectra of compounds **1, 2, 3**, and **4**, the expected ratios of the methylene-to-cyclohexane protons were observed. The methylene protons (–CH_2—Te) appeared as doublets at 2.55, 3.73, 3.61,

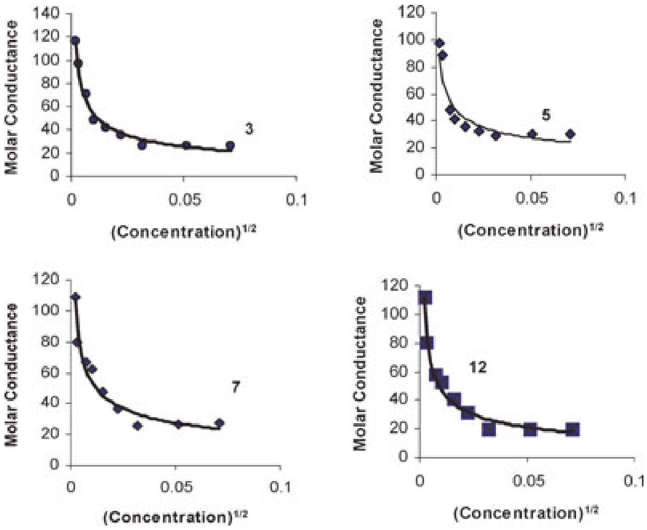


FIGURE 1 Plot of molar conductance (Λ_M, ohm^{-1} cm^2 mol^{-1}) against $\sqrt{C}$ for compounds **3, 5, 7**, and **12** in DMSO solution.

TABLE 2 Physical and Analytical Data for Previously Unreported Hg(II) Complexes

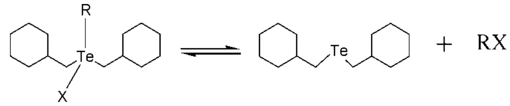
Complex[a]		Color	*MP (°C)*	*Yield (%)*	*Analysis*[b]		
					C	*H*	*Te*[c]
$R_2Te{\cdot}HgCl_2$	(**15**)	White	128–129	85	27.95 (28.33)	4.64 (4.42)	21.32 (21.50)
$R_2Te{\cdot}HgBr_2$	(**16**)	Yellow	108–109	76	23.91 (24.64)	3.67 (3.84)	18.52 (18.69)
$R_2Te(CH_3)I{\cdot}HgCl_2$	(**17**)	White	124–125	78	25.13 (24.49)	4.23 (3.97)	17.15 (17.35)
$R_2Te(CH_3)I{\cdot}HgCl_2$	(**18**)	White	96	87	22.35 (21.85)	3.87 (3.54)	15.25 (15.48)
$R_2Te(PhCH_2)Br{\cdot}HgCl_2$	(**19**)	White	131–132	66	32.62 (32.99)	3.98 (4.35)	16.32 (16.69)
$R_2Te(PhCH_2)Br{\cdot}HgCl_2$	(**20**)	White	129	79	29.91 (29.55)	4.14 (3.91)	14.56 (14.95)

[a] $R = -CH_2C_6H_{11}$.

[b] Calculated values are in parentheses.

[c] Tellurium was analyzed according to a literature method [18].

and 3.50 ppm, respectively. The protons of cyclohexane ring appeared as a complex signal between 1.0 and 2.70 ppm (Table 1). The chemical shifts of methylene protons (i.e., $-CH_2$—Te) for compounds **2**, **3**, and **4** depend on the size and electronegativity of the halogen covalently attached to the tellurium atom. The spectra of compounds **5**–**9** are complex and show extra signals. The spectrum of compound **5** shows a singlet at 3.52 ppm, a doublet at 3.10 ppm, an unsymmetrical doublet at 2.55 ppm, and a broad and complex signal between 0.80 and 2.10 ppm (Table 1). The complexity of this spectrum could be attributed to the occurrence of reductive elimination of these compounds in $CDCl_3$ solution. Thus, the unsymmetrical doublet signal could be attributed to the sum of the doublet of Te—CH_2—Cy and the singlet of CH_3I. The spectrum of compound **5** was studied as a function of time; no change was observed after 24 h and the position of methyl resonance did not vary with time. This may indicate that alkylation and dealkylation reactions were in equilibrium as previously observed for other telluronium salts [1–5]. The ^1H NMR spectra of compounds **6, 7, 8**, and **9** show extra signals, which may be due to the existence of compound **1**, alkyl halides, and telluronium salts in the solution (Table 1). Thus, it can be concluded that compounds **5**–**9** tend to eliminate alkyl and phenacyl halides in $CDCl_3$ solution and equilibration took place between the telluronium salts and di(cyclohexylmethyl)telluride and alkyl halides, as shown in the following equation:



The ^1H NMR spectra of compounds **11**–**14** show the expected aliphatic-to-aromatic ratio. There are no complexities or extra signals due to the reductive elimination or to the equilibration between the reducing and oxidizing forms (Table 1). This may be attributed to the Te–π interaction between the tellurium atom and one phenyl group of the BPh_4^- anion [14,15].

The reaction between equimolar quantities of compounds **1, 5**, and **7** with $HgCl_2$ or $HgBr_2$ afforded 1:1 complexes as white precipitates (except complex **16**) (Table 2). The IR spectra of the complexes **15, 16, 17, 19**, and **20** are quite similar to those of the free ligands. The spectra of complexes **15, 17**, and **19** show weak bands at 305, 310, and 310 cm^{-1}, respectively, which are attributed to ν(Hg—Cl) [19]. The bands assigned to ν(Hg—Cl) were absent in the spectra of the bromo complexes **16, 18**, and **20**. We were unable to study these complexes by NMR spectroscopy, by conductivity measurements, or by molecular weight determinations due their insolubilities in organic solvents such as chloroform, DMSO, or DMF. Thus, the present data do not allow a structural elucidation of these complexes and do not justify further speculation.

In conclusion, evidence was presented to suggest that these organotellurium compounds form complexes with a range of metal salts.

EXPERIMENTAL

Physical Measurements

^1H NMR spectra were obtained with a Jeol EX-90FT NMR instrument. They were recorded in $CDCl_3$ solutions containing Me_4Si as internal reference and are reported in δ units. Infrared spectra were recorded with KBr discs in the range of 4000–200 cm^{t1} on a Pye-Unicam SP-300s Infrared Spectrophotometer. Microanalysis for carbon, hydrogen, and nitrogen was obtained on a Carlo-Erba EA1108 Elemental Analyzer. All melting points were determined by a Gallenkamp melting point apparatus and are uncorrected. Molecular weight determinations were carried out in benzene using KANUER

Cryoscopicmeter. Molar conductances at 10^{-3} to 10^{-5} M dilution in DMSO were measured with a WTW Conductivity meter LBR, using a conductivity cell with a cell constant of 0.69 cm^{-1}.

Syntheses

All experiments were carried out under pure, dry nitrogen. Solvents were dried and saturated with nitrogen and all glasswares were oven-dried and filled with nitrogen. Bromomethylcyclohexane was prepared from cyclohexylmethanol according to a literature method [20].

*Di(cyclohexylmethyl)telluride (**1**).* To a suspension of tellurium powder (4.22 g; 33 mmol) in 20% aqueous sodium hydroxide (70 cm^3) was added sodium borohydride (3.14 g; 83 mmol) in one portion. The mixture was refluxed under nitrogen atmosphere for 3 h, giving a pale yellow solution of Na_2Te. To the resulting yellow solution was added a deaerated solution of bromomethylcyclohexane (11.68 g; 66 mmol) in 150 cm^3 of methanol. The solution was refluxed for 5 h, and then cooled to room temperature. The solution was filtered hot, cooled to room temperature, and extracted with diethyl ether (3 × 100 cm^3). The combined extracts were dried with anhydrous $MgSO_4$. Evaporation of solvent gave a heavy yellow oil with unpleasant odor in 58.5% yield (6.23 g).

Anal. Calcd for $C_{14}H_{26}Te$: C, 52.23; H, 8.14. Found: C, 52.05; H, 7.96.

*Di(cyclohexylmethyl)tellurium diiodide (**2**).* To a solution of compound **1** (0.5 g; 1.5 mmol) in 10 cm^3 of dry ether was added drop by drop a solution of iodine (0.39 g; 1.5 mmol) in 10 cm^3 of dry ether. An orange precipitate was formed immediately. The precipitate was washed with ethanol and dried. The product was recrystallized from ethanol/chloroform (4:1) to give orange crystals in 84% yield (0.75 g), mp 153°C. Λ_M (DMSO): 36.6 ohm^{-1} cm^2 mol^{-1}.

Anal. Calcd for $C_{14}H_{26}TeI_2$: C, 29.20; H, 4.55. Found: C, 30.04; H, 5.03.

*Di(cyclohexylmethyl)tellurium dibromide (**3**).* This compound was prepared by the following two methods:

Method A: To a solution of compound **1** (0.5 g; 1.5 mmol) in 10 cm^3 of dry ether was added dropwise a solution of bromine (0.25 g; 1.5 mmol) in 10 cm^3 of dry ether with stirring. The pale yellow precipitate was filtered off, washed with ethanol, recrystallized from ethanol/chloroform (1:2), and the resulting white crystals dried in vacuo. Yield 77.5% (0.58 g), mp 140–142°C.

Method B: Cyanogen bromide (0.165 g; 1.5 mmol), compound **1** (0.5 g; 1.5 mmol), and 20 cm^3 of dry ether were placed in a flask flushed with dry nitrogen. An exothermic reaction took place. The mixture was left for 1 h at room temperature. Evaporation of solvent gave a very pale precipitate. Recrystallization from mixture of ethanol and chloroform (4:1) gave white crystals in 56.1% yield (0.42 g), mp 138–140°C. Λ_M (DMSO): 26.4 ohm^{-1} cm^2 mol^{-1}.

Anal. Calcd for $C_{14}H_{26}TeBr_2$: C, 34.90; H, 5.34. Found: C, 35.31; H, 5.19.

*Di(cyclohexylmethyl)tellurium dichloride (**4**).* Chlorine gas was slowly bubbled through a solution of compound **1** (0.5 g; 1.5 mmol) in 20 cm^3 of dry ether with stirring for 30 min. A white precipitate formed was filtered off, dried, and recrystallized from ethanol/chloroform (4:1) to give white crystals in 85% yield (0.52 g), mp 136°C. Λ_M (DMSO): 16.3 ohm^{-1} cm^2 mol^{-1}.

Anal. Calcd for $C_{14}H_{26}TeCl_2$: C, 42.80; H, 6.67. Found: C, 43.27; H, 6.16.

*Di(cyclohexylmethyl)methyltelluronium iodide (**5**).* Excess of freshly distilled iodomethane (0.44 g; 3.1 mmol) dissolved in 10 cm^3 dry ether was added to compound **1** (0.5 g; 1.5 mmol) in 10 cm^3 of dry ether. An exothermic reaction took place. The reaction mixture was left for 24 h at room temperature. The white precipitate was collected by filtration, dried, and recrystallized from ethanol. White crystals were obtained in 79% yield (0.57 g), mp 103–104°C. Λ_M (DMSO): 29.6 ohm^{-1} cm^2 mol^{-1}.

Anal. Calcd for $C_{15}H_{29}TeI$: C, 38.83; H, 6.30. Found: C, 39.07; H, 6.60.

The following compounds were prepared by the reaction of the appropriate alkyl halide with compound **1** under the conditions reported for compound **5**:

*Di(cyclohexylmethyl)ethyltelluronium bromide (**6**)*: White crystals, mp 100–101°C. Yield 73% (0.49 g).

Anal. Calcd for $C_{16}H_{31}TeBr$: C, 44.55; H, 7.25. Found: C, 44.23; H, 6.94.

*Di(cyclohexylmethyl)benzyltelluronium bromide (**7**)*: White crystals, mp 142°C. Yield 87.5% (0.67 g). Λ_M (DMSO): 26.8 ohm^{-1} cm^2 mol^{-1}.

Anal. Calcd for $C_{21}H_{33}TeBr$: C, 51.16; H, 6.74. Found: C, 51.35; H, 6.38.

*Di(cyclohexylmethyl)(2,6-dichlorobenzyl)telluronium bromide (**8**)*: White crystals, mp 135°C. Yield 81% (0.71 g). Λ_M (DMSO): 25.9 ohm^{-1} cm^2 mol^{-1}.

Anal. Calcd for $C_{21}H_{31}Cl_2TeBr$: C, 44.89; H, 5.56. Found: C, 45.38; H, 5.82.

*Di(cyclohexylmethyl)(4-bromophenacyl)telluronium bromide (**9**)*: White crystals, mp 93°C. Yield 54% (0.51 g). Λ_M (DMSO): 35.1 ohm^{-1} cm^2 mol^{-1}.

Anal. Calcd for $C_{22}H_{32}TeOBr_2$: C, 44.01; H, 5.43. Found: C, 45.19; H, 5.65.

*Di(cyclohexylmethyl)succinimidotelluronium bromide (**10**)*: *N*-Bromosuccinimide (0.28 g; 3.1 mmol) was added to di(cyclomethyl)telluride (1.0 g; 3.1 mmol) in 20 cm^3 of dry benzene. A white precipitate formed after 45 min. Recrystallization from ethanol/chloroform (1:3) gave white crystals in 93% yield (1.45 g), mp 153–155°C.

Anal. Calcd for $C_{18}H_{30}TeNO_2Br$: C, 44.01; H, 5.43; N, 2.80. Found: C, 44.19; H, 5.65; N, 2.57.

*Di(cyclohexylmethyl)phenyltelluronium tetraphenylborate (**11**)*: A hot ethanolic solution of sodium tetraphenylborate (1.70 g; 5 mmol) was added with stirring to a solution of di(cyclohexylmethyl) tellurium dibromide (**2**) (0.96 g; 2 mmol) in 5 cm^{3}of chloroform. A fine white precipitate formed immediately. The resulting mixture was heated under reflux with stirring for an hour. The white precipitate was collected, washed with ethanol, and dried in vacuo. Recrystallization from DMF and water gave white precipitate of compound **10** in 51% yield (0.74 g), mp 131–133°C. Λ_M (DMSO): 16.5 ohm^{-1} cm^2 mol^{-1}.

Anal. Calcd for $C_{44}H_{51}TeB$: C, 73.80; H, 7.20. Found: C, 74.20; H, 7.6.

*Di(cyclohexylmethyl)methyltelluronium tetraphenylborate (**12**)*: To $(C_6H_{11}CH_2)_2(CH_3)TeI$ (**5**) (0.92 g; 2 mmol) dissolved in 20 cm^3 of hot ethanol was added a solution of sodium tetraphenylborate (0.85 g; 2.5 mmol) in 10 cm^3 ethanol. A white precipitate formed immediately. The resulting mixture was refluxed for 15 min. The precipitate was collected by filtration and washed with water and ethanol, respectively. Recrystallization from DMF/H_2O (1:1) gave white crystals in 62% yield (0.82 g), mp 164–165°C. Λ_M (DMSO): 20.3 ohm^{-1} cm^2 mol^{-1}.

Anal. Calcd for $C_{39}H_{49}TeB$: C, 71.38; H, 7.52. Found: C, 71.34; H, 7.32.

*Di(cyclohexylmethyl)benzyltelluronium tetraphenylborate (**13**)*: The reaction of compound **7** (1.23 g; 2.5 mmol) with sodium tetraphenylborate (0.85 g; 2.5 mmol) was carried out by the same method as described above. White crystals were obtained in 65% yield (1.2 g), mp 153°C. Λ_M (DMSO): 16.7 ohm^{-1} cm^2 mol^{-1}.

Anal. Calcd for $C_{45}H_{53}TeB$: C, 73.80 H, 7.29. Found: C, 73.54; H, 7.22.

*Di(cyclohexylmethyl)(2,6-dichlorobenzyl)telluronium tetraphenylborate (**14**)*: This compound was prepared by the same method reported for the preparation of compounds **13–8** (1.41 g; 2.5 mmol) with sodium tetraphenylborate (0.85 g; 2.5 mmol) in ethanol. White crystals were obtained in 61% yield (1.23 g), mp 150°C. Λ_M (DMSO): 14.3 ohm^{-1} cm^2 mol^{-1}.

Anal. Calcd for $C_{45}H_{51}TeB$: C, 67.45; H, 6.41. Found: C, 67.66; H, 6.23.

Mercury(II) complexes. These complexes were all prepared by the reaction of HgX_2 (X = Cl and Br) with compounds **1, 5**, and **7**. The general method is illustrated by the following example:

*Synthesis of $[(C_6H_{11}CH_2)_2Te.HgCl_2]$ (**15**)*: Mercury(II) chloride (0.84 g; 3.1 mmol) dissolved in ethanol/water was added to a solution of compound **1** (1.0 g; 3.1 mmol) in 50 cm^3 of DMF. The mixture was stirred for 30 min and a white precipitate was formed. This precipitate was washed several times with water and ethanol, respectively, and dried in vacuo. Complex **15** was obtained in 85% yield (1.58 g), mp 128–129°C.

All Hg(II) complexes and their physical properties are shown in Table 2.

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