Synthesis, Spectral Characterization of Four Symmetrical and Unsymmetrical Organotellurium(II) Compounds: $O-H\cdots N$, $CH\cdots \pi$, and $CH\cdots O$ Secondary Interactions in X-Ray Crystal Structures of 4-MeOC₆H₄TeCH₂ $CH_2CH_2N=C(CH_3)C_6H_4-2-OH$ (**1**) and Te[CH₂CH₂CH₂CH₂N=C(CH₃)C₆H₄-2-OH]₂ (**2**)

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ABSTRACT: The condensation of 3-(4-methoxyphenyltelluro)propylamine and bis(3-aminopropyl) telluride with 2-hydroxyacetophenone formed two Schiff's 2-[1-(3-(4-methoxyphenyltellanyl) bases propylimino)ethyl]phenol (1) and Bis 2-[1-(3*iminopropyltellanyl)ethyl]phenol* (2), *respectively*. The reduction of 1 and 2 gave compounds 2-[1-(3-(4-methoxyphenyltellanyl)propylamino)ethyl]phenol (3) and Bis 2-[1-(3-aminopropyltellanyl)ethyl]phenol (4), respectively. These four new organotellurium compounds (1–4) were characterized by ¹H and ¹³C NMR and FTIR spectroscopies and atomic absorption spectrophotometer (AAS) (Te). The conductance and molecular weights and composition by elemental analysis (C, H, and N) of 1 and 2 were determined. The compound **4** was also characterized by ${}^{13}C$ DEPT-135 NMR spectrum. The compounds 1 and 3 are unsymmetrical, and 2 and 4 are symmetrical type of telluroethers. The single crystals of 1 and **2** were grown, and their molecular structures were determined by single crystal X-Ray diffraction. The ArC-Te bond length in 1 was found 2.117(7) Å. The RC-Te bond length in 1 is 2.141(5) Å and in 2 is 2.146(5) and 2.150(6) Å. The > C=N bond lengths in **1** and **2** were between 1.278(6) and 1.295(6) Å. There exists intramolecular $O-H\cdots N$ hydrogen bonding [between 1.758(4) and 1.792(4) Å] in 1 and 2. In compound 2, these nonbonded interactions result in the formation of a R_2^2 (34) dimeric ring. CH...O [2.505(4)-2.516(3) Å] in **1** and **2** and CH^{...} π [2.61(5)and 2.89(4) Å] secondary interactions are also present in 2. © 2015 Wiley Periodicals, Inc. Heteroatom Chem. 00:1-9, 2015; View this article online at wileyonlinelibrary.com. DOI 10.1002/hc.21262

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INTRODUCTION

The increased interest in the synthesis and structural characterization of organotellurium compounds for the past three decades has been due to their enhanced applications in various fields of science. These compounds have been used in organic chemistry as excellent synthons [1], biochemistry [2], toxicological studies [3], photography [4], the synthesis of polymers as reagents [5] and insecticides [6], and coordination chemistry as ligands [7]. Pd(II) complexes of hybrid ligands containing tellurium as a soft donor along with hard donors (N/O)have been used as catalysts in organic reactions such as Suzuki-Miyaura and Heck C-C cross-coupling reactions [8]. However, despite their potential applications, their wide utilization in diverse areas has largely been restricted due to their fewer synthetic methodologies, difficulty in purification, weak C-Te bond, and their unstable nature. The organotellurium compounds are stabilized by formation of supramolecular structures via secondary interactions [9]. Therefore, it would be worth to synthesize organotellurium compounds having secondary interaction, which can stabilize them and can act as hybrid ligands as their Pd(II) complexes can be used as excellent catalysts in C-C coupling reaction in organic synthesis. Therefore, herein we report the synthesis of four new organotellurium compounds 1–4 by simple Schiff base condensation and reduction protocol, their characterization, and single crystal X-ray structures of 2-[1-(3-(4methoxyphenyltellanyl)propylimino)ethyl]phenol (1) and Bis 2-[1-(3-iminopropyltellanyl)ethyl]phenol (2). The molecular structure of 1 and 2 contain intramolecular O-H ... N hydrogen bonding and CH…O and CH… π secondary interactions.

EXPERIMENTAL

Chemicals

3-Chloropropylamine hydrochloride and 2-hydroxy acetophenone were procured from Merck (India) and Aldrich (USA), respectively, and used as received. All the solvents were purchased from Merck (India) and used after purification. Bis(4methoxyphenyl) ditelluride [10], disodium telluride (Na₂Te) [11], bis(3-aminopropyl)telluride [12] and 3-(4-methoxyphenyltelluro)propylamine [13] were synthesized as per the reported methods.

Analytical Methods

The C, H, and N analyses were carried out using a Perkin–Elmer elemental analyzer 240 C (Massachusetts, USA). The tellurium estimation [14] was carried out on a Perkin-Elmer Analyst 100 atomic absorption spectrophotometer (AAS) (Massachusetts, USA). The molecular weights were determined in chloroform at different concentrations (generally 5–10 mM) by a KNAUER vapor pressure osmometer (model no. A-0280) (Berlin, Germany) in which benzil was used as a calibration standard (accuracy \pm 5.0 amu). The ¹H and ¹³C NMR (Bruker, USA) spectra were recorded on a Bruker Spectrospin DPX-300 NMR spectrometer at 300.13 and 75 MHz, respectively. FTIR spectra in the range of 4000–250 cm⁻¹ were recorded on a Nicolet Prote'ge 460 FT-IR (NICODOM Ltd., Hlavni, Czech Republic, EU) spectrometer as KBr pellets. The melting points were determined in open capillary tubes and are reported as such. The molar conductance (Λ_M) measurements were carried out in CH₃CN (concentration ca 1 mM) using the ORION conductivitymeter model 162 (Cole-Parmer India Pvt. Ltd., Powai, Mumbai, India).

X-Ray Data Collection and Structure Refinement Details

The single crystal X-ray diffraction data of 1 and 2 were collected at IIT Delhi, New Delhi, India, on a Bruker SMART CCD diffractometer with Mo K α ($\lambda = 0.71073$ Å) X-radiations at 25°C. Crystal structures of 1 and 2 were solved using SHELXTL [15]. The software SADABS was used for absorption corrections and SHELXTL for space group, structure determination, and refinements [15, 16]. All nonhydrogen atoms were located from the difference Fourier map using geometrical constraints and were refined anisotropically. The least-squares refinement cycles on F^2 were performed until the model converged.

Synthesis of 4-MeOC₆H₄TeCH₂CH₂CH₂N= C(CH₃)C₆H₄-2-OH (**1**)

2-(4-Methoxyphenyltelluro) propyl amine (1.47 g, 5.0 mmol) was stirred for 0.5 h in 20 mL of dry ethanol at room temperature. *o*-Hydroxyacetophenone (0.6 mL, 5.0 mmol) dissolved in 20 mL of dry ethanol was added to the above solution dropwise with stirring. The mixture was stirred for further 1–2 h at room temperature. The solution was concentrated on a rotary evaporator, resulting in a yellow precipitate. The precipitate was filtered, and on recrystallization from a 1:1 mixture of chloroform and hexane gave yellow single crystals of **1**.

Yield: 80%; mp: 85–86°C; $\Lambda_M = 0.7$ S cm² mol⁻¹. Elemental analyses: Found (Calcd.) for C₁₈H₂₁NO₂Te: C, 52.61 (52.61), H, 5.16 (5.15), N, 3.45 (3.41), Te, 31.00 (31.05); Molecular weight:



SCHEME 1 Synthesis of organotellurium compounds 1-4.

Found (Calcd.), 411 (413); NMR: ¹H (CDCl₃, 25°C): δ (vs. TMS): 2.19 (quintet, J = 5.7 Hz, 2H, H₂), 2.26 (s, 3H, CH₃), 2.95 (t, J = 5.8 H,z 2H, H₃), 3.75 (s, 3H, OCH₃), 3.59 (t, J = 6.3 Hz, 2H, H₁), 6.70–6.73 (d, J = 8 Hz, 2H, ArH *m* to Te), 6.75 (t, J = 7 Hz, 1H, H₈), 6.89–6.93 (d, J = 8.4 Hz, 1H, H₁₀), 7.27 (t, J = 6.9 Hz, 1H, H₉), 7.46–7.48 (d, J = 8.1 Hz, 1H, H₆), 7.66–7.68 (d, J = 8.4 Hz, 2H, ArH *o* to Te), 16.50 (bs, 1H, OH); ¹³C (CDCl₃, 25°C): δ (vs. TMS): 5.96 (C₂), 14.44 (CH₃), 31.96 (C₃), 50.33 (C₁), 55.14 (OCH₃), 100.14 (ArC–Te), 115.22 (ArC *m* to Te), 116.82 (C₇), 118.83 (C₇), 119.34 (C₅), 127.93 (C₁₀), 132.51 (C₈), 140.93 (ArC *o* to Te), 159.82 (ArC–OCH₃), 164.3 (C₆), 171.93 (C₄); FTIR (KBr, cm⁻¹): 1645 (>C=N), 292, Te–C(aryl), 504, Te–C(alkyl).

Synthesis of $Te[CH_2CH_2CH_2N=C(CH_3)C_6H_4$ -2-OH]₂ (**2**)

Bis(3-aminopropyl)telluride (0.4678/0.5375 g, 2.5 mmol) was stirred for 0.5 h in 20 mL of dry ethanol at room temperature. 2-Hydroxy-acetophenone (0.6 mL, 5 mmol) dissolved in 20 mL of dry ethanol was added to the above solution dropwise with stirring. The mixture was stirred at room temperature for further 6 h and kept at 0–5°C for 24 h. The compound **2** was separated as a yellow precipitate. The precipitate was filtered, and on recrystallization at 0–5°C from a 1:1 mixture of chloroform and hexane gave single crystals of **2**.

Yield: 70%;mp: 95–96°C; $\Lambda_M = 0.9$ S cm² mol⁻¹. Elemental analyses: Found (Calcd.) for



C₂₂H₂₈N₂O₂Te: C, 54.94 (55.04), H, 5.86 (5.88), N, 5.69 (5.84), Te, 26.04 (26.58); Molecular weight: Found (Calcd.), 480 (481); NMR: ¹H (CDCl₃, 25°C): δ (vs. TMS): 2.18 (quintet, J = 6.6 Hz, 2H, H₂), 2.33 (s, 3H, CH₃), 2.79 (t, J = 6.9 Hz, 2H, H₃), 3.61 (t, J = 5.4 Hz, 2H, H₁), 6.75 (t, J = 7.2 Hz, 1H, H₈), 6.89–6.91 (d, J = 8.1 Hz, 1H, H₁₀), 7.27 (t, J =7.4 Hz, 1H, H₉), 7.47–7.50 (d, J = 7.8 Hz, 1H, H₆), 16.50 (bs, 1H, OH); ¹³C (CDCl₃, 25°C): δ (vs. TMS): 1.06 (C₂), 14.37 (CH₃), 32.45 (C₃), 50.48 (C₁), 116.83 (C₇), 118.74 (C₉), 130.62 (C₅), 127.91 (C₁₀), 136.42 (C₈), 164.26 (C₆), 171.95 (C₄); FTIR (KBr, cm⁻¹): 1650 (>C=N), 292, Te-C(aryl), 518, Te-C(alkyl).

Synthesis of $4-MeOC_6H_4TeCH_2CH_2CH_2NHCH(CH_3)C_6H_4-2-OH$ (**3**) and $Te[CH_2CH_2CH_2NHCH(CH_3)C_6H_4-2-OH]_2$ (**4**)

The compounds **1** or **2** (0.413 g/0.480 g, 1 mmol) and NaBH₄ (0.38 g, 10 mmol) was refluxed for 24 h in 100 mL dry ethanol. The solution was cooled, and the solvent was evaporated on a rotary evaporator and dried under vacuum resulting in a residue. The compound 2-[1-(3-(4methoxyphenyltellanyl)propylamino)ethyl]phenol (**3**) or Bis 2-[1-(3-aminopropyltellanyl)ethyl]phenol (**4**) was extracted into dichloromethane (100 mL) from the residue obtained. The solution was dried with anhydrous sodium sulfate. On removing the solvent using rotary evaporator, **3** or **4** was obtained as highly viscous colorless oils.



FIGURE 1 ¹³C DEPT-135 NMR spectrum of 4-MeOC₆H₄TeCH₂CH₂CH₂NHCH(CH₃)C₆H₄-2-OH (**4**).

Compound **3.** Yield: 80%; $\Lambda_{\rm M} = 0.8 \, {\rm S} \, {\rm cm}^2 \, {\rm mol}^{-1}$. Te, 30.86 (30.90); NMR: ¹H (CDCl₃, 25°C): δ (vs. TMS): 1.27-1.29 (d, J = 6.6 Hz, 3H, CH₃), 1.78-1.88(quintet, J = 7.1 Hz, 2H, H₂), 2.46–2.57 (m, 2H, H₃), 2.59–2.74 (m, 2H, H₁), 3.68 (s, 3H, OCH₃), 3.69–3.77 $(q, J = 7.7 \text{ Hz}, 1\text{H}, \text{H}_4), 6.64-6.66 \text{ (d}, 2\text{H}, J = 7.4 \text{ Hz},$ ArH *m* to Te), 6.68 (t, J = 6.9 Hz, 1H, H₈), 6.80–6.83 $(d, J = 8.4 \text{ Hz}, 1\text{H}, \text{H}_{10}), 7.03 (t, J = 7.8 \text{ Hz}, 1\text{H},$ H₉), 7.55–7.57 (d, 3H, J = 8.4 Hz, H₆ and H_{12,16}); ¹³C (CDCl₃, 25°C): δ (vs. TMS): 6.25 (C₂), 22.26 (CH₃), 31.52 (C₃), 48.81 (C₁), 55.04 (OCH₃), 58.95 (C₄). 100.07 (ArC–Te), 115.13 (ArC *m* to Te), 116.54 (C₇), 118.81 (C₉), 126.51 (C₅), 127.92 (C₁₀), 128.94 (C₈), 141.13 (ArC o to Te), 157.12 (ArC-OCH₃), 159.72 (C_6) , 171.93; FTIR (KBr, cm⁻¹): 3487, 1545 (N-H); 283, Te-C(aryl); 520, Te-C(alkyl).

Compound **4.** Yield: 75%; $\Lambda_{\rm M} = 0.9$ S cm² mol⁻¹. Te, 26.33 (26.36); NMR: ¹H (CDCl₃, 25°C): δ (vs. TMS): 1.35–1.38 (d, J = 6.8 Hz, 3H, CH₃), 1.75–1.86 (quintet, J = 6.6 Hz, 2H, H₂), 2.45–2.76 (m, 4H, H_{1,3}), 3.69–3.77 (q, J = 7.6 Hz, 1H, H₄), 6.68 (t, J = 8.0 Hz, 1H, H₈), 6.80–6.83 (d, J = 8.4 Hz, 1H, H₁₀), 7.03 (t, J = 7.6 Hz, 1H, H₉). 11.76 (bs, 1H, OH). **13C** (CDCl₃, 25°C): δ (vs.. TMS): –2.04 (C₂), 22.10 (CH₃), 31.80 (C₃), 48.91 (C₁), 58.83 (C₄), 116.33 (C₇), 118.72 (C₉), 126.32 (C₅), 127.74 (C₁₀), 127.93 (C₈), 156.81 (C₆); FTIR (KBr, cm⁻¹): 3406, 1578 (N–H); 282, Te–C(aryl); 512, Te–C(alkyl).

RESULTS AND DISCUSSION

The organotellurium compounds **1–4** were synthesized as per the reactions given in Scheme 1.

Organotellurium compounds 1 and 2 are yellow crystalline solids, whereas 3 and 4 are colorless viscous liquids. The compounds 1–4 are freely soluble in chloroform, dichloromethane, ethanol, methanoland acetone but insoluble in diethyl ether and hexane.

The molar conductance was measured for all the compounds in acetonitrile at the ~1 mM concentration level at room temperature (25°C). The found molar conductance is much lower than the values expected for a 1:1 electrolyte (120–160 S cm² mol⁻¹) [17]. This suggests that all the compounds are nonelectrolytes and do not dissociate appreciably. These observations are further supported by the molecular weights of the compounds **1** and **2**. The molecular weights were also found to be consistent with their monomeric nature in solution.

The FTIR spectra of **1** and **2** are characteristic and showed >C=N stretching vibrations [18] at 1645 and 1650 cm⁻¹, respectively, whereas these bands were absent in the IR spectra of **3** and **4**. The Te-C (alkyl) stretching vibrations were observed in the IR spectra at 504–520 cm⁻¹, whereas those of Te-C(aryl) appear at 282–292 cm⁻¹, which are comparable with the literature values [19].

The ¹H and 13C NMR spectra of organotellurium compounds 1-4 are characteristic [20]. A highly deshielded (due to intramolecular OH \cdots N hydrogen bonding) singlet at 16.00 ppm was assigned to Ar-OH proton in 1 and 2, whereas the signal for these protons in 3 and 4 was appeared at 11.40 ppm as a very broad singlet.

In ¹H and ¹³C NMR spectra of **3** and **4** CH_3 protons CH proton couple each other and appeared as doublet at 1.27 and a quartet at 3.69–3.76 ppm, respectively.

In ¹³C NMR spectrum of **3** the C₅ and CH₃ carbon signals are deshielded by 7.20 and 7.86 ppm, respectively. The C₁ carbon signal was shielded by 1.5 ppm, whereas C₄ signal was deshielded by about 113 ppm, respectively, relative to the respective carbon signals of **1**. This large shielding of C₄ carbon

TABLE 1 Crystal Data and Structure Refinement Parameters for 1 an

Characteristic	1	2
Empirical formula	C ₁₈ H ₂₁ NO ₂ Te	C ₂₂ H ₂₈ N ₂ O ₂ Te
Formula weight	410.96	480.06
Color	Yellow	Yellow
Crystal size, mm3	0.319 imes 0.21 imes 0.049	$0.392 \times 0.219 \times 0.042$
Crystal system	Monoclinic	Monoclinic
Space group	P21/c	P21/c
Unit cell dimensions	<i>a</i> = 19.0344(18) Å	<i>a</i> = 7.9931(15) Å
	b = 6.6866(6) Å	<i>b</i> = 12.428(2) Å
	<i>c</i> = 14.2601(14) Å	<i>c</i> = 21.433(4) Å
	$lpha=\gamma=$ 90°,	$lpha=\gamma=$ 90°,
	$eta=$ 105.761(2) $^\circ$	$eta=$ 100.75(2) $^\circ$
<i>V</i> , Å3	1746.7(3)	2091.8(7)
Ζ	4	4
ρ , (calcd.), mg/m3	1.563	1.524
μ , mm–1	1.71	1.441
<i>F</i> (000)	816	968
θ , range (°)	1.1–25.50	1.90–25.0
Index ranges	$-22 \le h \le 23$	$-9 \le h \le 9$
	$-8 \leq k \leq 8,$	$-14 \leq k \leq 14$
	− 17 ≤ <i>l</i> ≤ 17	$-25 \le l \le 25$
Reflections collected	12,596	14,891
Independent reflections	$3685[R_{(int)} = 0.0841]$	$3242[R_{(int)} = 0.0323]$
Completeness to max. θ , %	99.9	99.8
Maximum and minimum transmission	0.655 and 0.922	0.689 and 0.943
Data/restraints/parameters	3242/0/202	3685/0/226
Goodness-of-fit on F2	1.054	1.162
Final <i>R</i> indices $[I > 2\sigma(I)]$	$H_1 = 0.0568, wR_2 = 0.121$	$R_1 = 0.0631, wR_2 = 0.133$
R indices (all data)	$R_1 = 0.0805, wR_2 = 0.132$	$R_1 = 0.0793, wR_2 = 0.142$
Largest difference peak and hole, e Å-3	0.88 and -0.59	0.89 and -0.46

is due to transformation from imine $(-C_4=N-)$ into amine $(-C_4H-NH-)$. The signal for C₃ carbon was observed at 31.96 ppm in **1**, but this signal was shielded by 0.5 ppm in **3**. In the ¹³C NMR spectrum of **4**, the C₁ and C₃ carbon signals were shielded by 1.0–2.0 ppm, whereas the CH₃ and C₄ signals were shielded by about 8 and 70 ppm, respectively, when compared to the respective carbon signals in **2**. The compound **4** was also characterized by ¹³C DEPT-135 NMR spectrum (Fig. 1) in which the CH₂ signals were observed directing toward the base line, the CH and CH₃ signals directing upward and the quaternary carbon peaks were absent.

The crystal data and refinement parameters for **1** and **2** are given in Table 1, and selected bond lengths and bond angles of **1** and **2** are given in Table 2. The O-H… N intramolecular hydrogen bonding and CH… π and CH…O secondary interactions of **1** and **2** are given in Table 3.

The ORTEP diagram of **1** is shown in Fig. 2. In compound **1**, Te–C(alkyl) [Te(1)–C(12), 2.141(5)] bond length is longer than Te–C(aryl) [Te(1)–C(1), 2.117(7)] and these values are comparable with the values [2.140(8) and 2.107(8), respectively] reported for the compound, *N*-[2-(4-methoxyphenyltelluro)ethyl]benzamide [21]. The

C(5)–Te(1)–C(8) bond angle of **1** (96.00 (2)°) is slightly wider than the value [94.96(14)°] reported for *N*-[2-(4-methoxyphenyltelluro) propyl] phthalimide [21] and slightly narrower than the value [98.8(3)°] reported for *N*-[2-(4-methoxy phenyltelluro)ethyl]benzamide [21], which may be due to longer alkyl chain and the N(11)=C(1) bond length is 1.295(6) Å, which is consistent with the literature value reported for similar Schiff base compound 4-MeOC₆H₄TeCH₂CH₂N=C(CH₃)C₆H₄-2-OH [22].

In the crystal of **1**, there exists an O(2) $-H(2)\cdots N(1)$ [1.758(4) Å] intramolecular hydrogen bonding and the molecules are stabilized by two C(12) $-H(12C)\cdots O(2)$ [2.516(3) Å] and C(14) $-H(14)\cdots O(2)$ [2.519(3) Å] intermolecular secondary interactions as shown in Fig. 3.

The molecular structure of **2** is shown in Fig. 4. The Te–C(alkyl) bond lengths in **2** are 2.150(6) and 2.146(5) Å [Te(1)–C(1) and Te(1)–C(12), respectively]. The C–Te–C bond angle of **2** is 94.6(2)°. All are consistent with the reported values of *N*-[2-(4-methoxyphenyltelluro)propyl]phthalimide [21].

In tellurated Schiff base ligand **2**, there are two intramolecular hydrogen bonds, O(1) $-H(1)\cdots N(1)$ [1.761(4)] and O(2) $-H(2)\cdots N(2)$

Bond Lengths (Å)				
1		2	2	
Te(1)–C(5)	2.117(7)	Te(1)-C(1)	2.150(6)	
Te(1)–C(8)	2.141(5)	N(1)–C(3)	1.473(7)	
N(1)–C(10)	1.459(7)	N(2)–C(14)	1.458(6)	
N(1)–C(11)	1.295(6)	C(12)–C(13)	1.520(7)	
O(1)–C(1)	1.409(9)	Te(1)–C(12)	2.146(5)	
O(1)-C(2)	1.366(8)	N(1)–C(4)	1.278(6)	
C(5)–C(6)	1.373(7)	N(2)–C(15)	1.283(6)	
C(11)–C(12)	1.486(7)	O(1)–H(1)…N(1)	1.760(15)	
O(2)–H(2)…N(1)	1.758(4)	O(2)–H(2)…N(2)	1.792(4)	
	Bo	ond Angles (°)		
C(5)-Te(1)-C(8)	96.00(2)	C(4)–N(1)–C(3)	123.5(5)	
N(1)-C(10)-C(9)	109.57(4)	C(13)–C(12)–Te(1)	113.6(4)	
C(11) - N(1) - C(10)	122.5(4)	C(8)–C(9)–C(10)	119.9(6)	
C(9)-C(8)-Te(1)	113.7(4)	N(2)-C(14)-C(13)	111.9(4)	
C(6) - C(5) - Te(1)	122.3(5)	C(12) - Te(1) - C(1)	94.6(2)	
C(4) - C(5) - Te(1)	120.1(5)	C(15)–N(2)–C(14)	122.3(4)	
N(1) - C(11) - C(13)	116.9(4)	C(20)-C(21)-C(16)	121.9(5)	
N(1)–C(11)–C(12)	121.5(̀5)́	Č(2)–C(1)–Te(1)	114.4(́4)́	

TABLE 2	Selected Bond Ler	ngths (Å) and	Bond Angles ((°) of 1	and 2

TABLE 3 Secondary Interactions of 1 and 2

D–H···A	D-H	H···A	D····A	D–H···A
		Compound 1		
C12–H12C····O2 ⁱ	0.960(6)	. 2.516(3)	3.369(6)	148.08(0.34)
C14–H14····O2 ⁱ	0.930(5)	2.519(3)	3.419(6)	162.98(0.34)
02–H2···N1 ⁱⁱ	0.820(4)	1.758(4)	2.492(6)	148.06(0.30)
Symmetry code: (i) x, $y + 1$, z;	(ii) <i>x</i> , <i>y</i> , <i>z</i>	()	- (-)	()
		Compound 2		
C21–H21····O1 ⁱ	0.930(5)	2.505(4)	3.430(7)	173.48(0.35)
01–H1…N1 ⁱⁱ	0.820(4)	1.761(4)	2.4971(6)	147.57(0.30)
02–H2····N2 ⁱⁱ	0.820(4)	1.792(4)	2.506(5)	144.76(0.30)
$C(11) - H(11A) \cdots C\pi(2)$	0.960(e)	2.61(5)	3.534(7)	151.89(0.11)
$C(22) - H(22B) \cdots C\pi(1)$	0.960(6)	2.829(4)	3.569(6)	135.73(0.33)
Symmetry code: (i) $-x + 1$, $-y$	+ 1, -z + 1; (ii) x, y, z	()		· · · · · · · · · · · · · · · · · · ·

[1.792(4)], which are also consistent with the values reported for similar types of Schiff base compounds 4-MeOC₆H₄TeCH₂CH₂N=C(CH₃)C₆H₄-2-OH $2-HOC_6H_4(CH_3)C=NCH_2CH_2Te$ and $CH_2CH_2N=C(CH_3)C_6H_4-2-OH$ [22]. The intermolecular $C(21) - H(21) \cdots O(1) [2.505(4) Å]$ secondary interactions forming aR_2^2 (34) dimeric ring structure of 2 are shown in Fig. 5. In crystal packing of **2**, a pair of $C(11) - H(11A) \cdots C\pi(2)$ [2.61(5) Å] and $C(22) -H(22B) \cdots C\pi(1) [2.829(4)]$ Å] secondary interactions exists where $C\pi(1)$ and $C\pi(2)$ are the centroids for the ring C(5)–C(10) and C(16)-C(21), respectively, as shown in Fig. 6. The Te…Te (4.566 Å) distance between the two nearest molecules of 2 is greater than the sum of their vander Waal's radii (4.40 Å); therefore, this type of Te... Te secondary interactions has no significance in these compounds as reported for organotellurium compounds containing $-\text{Te}-\text{C}\equiv X$ (C and N) groups [23].

CONCLUSIONS

Four new organotellurium compounds were synthesized by simple Schiff's base condensation (1 and 2) and reduction by sodium borohydride (3 and 4). Compounds 1–4 were characterized by spectroscopic methods and conductance measurement, and the amount of tellurium was determined by AAS, the composition by elemental analysis and molecular weights of 1 and 2 were also determined. The single crystal structures of 1 and 2 were determined by X-ray diffraction. In the crystal structure of 1 and



FIGURE 2 ORTEP diagram of 4-MeOC₆H₄TeCH₂CH₂CH₂N=C(CH₃)C₆H₄-2-OH (1).



FIGURE 3 Crystal packing with $O-H\cdots N$ intramolecular hydrogen bonding and $C-H\cdots O$ intermolecular secondary interactions in 1.



FIGURE 4 ORTEP diagram of $Te[CH_2CH_2CH_2N=C(CH_3)C_6H_4-2-OH]_2$ (2).

2, there exists intramolecular $O-H \cdots N [1.758(4) \text{ Å}$ to 1.792(4)] hydrogen bonds, and the molecules are stabilized by two intermolecular $C-H \cdots O [2.505(4)$ and 2.516(3) Å] secondary interactions. The intermolecular $C-H \cdots O$ interactions resulting in to

the formation of the R_2^2 (34) dimeric ring structure of **2** and a pair of C-H··· π [2.61(5) and 2.829(4) Å] interactions were found in symmetric organotellurium compound **2**. These types of secondary interaction produce supramolecular structures and



FIGURE 5 Crystal packing of **2** with O–H···N intramolecular hydrogen bonding and C–H···O intermolecular secondary interactions resulting in to the formation of the R_2^2 (34) dimeric ring structure.



FIGURE 6 Crystal packing of **2** with $C-H\cdots\pi$ intermolecular secondary interactions.

hence increase the stability of less stable organtellurium compounds. from the Cambridge Crystallographic Data Centre, 12, Union Road, Cambridge CB2 1EZ, UK; fax: (int.) +44 1223 336 033; e-mail: deposit@ccdc.cam.ac.uk].

SUPPLEMENTARY DATA

CCDC numbers 1028609 and 1028526 contain the supplementary crystallographic data for **1** and **2**, respectively. These data can be obtained free of charge at www.ccdc.cam.ac.uk/conts/retrieving.html [or

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