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X-ray crystal structures of *trans*-(10-amino-3,7-diazadecanoato)dinitrocobalt(III) hydrate, *mer*(*N*)-(9-amino-3,7-diazanonato) dinitrocobalt(III) sesquihydrate, *mer*(*N*)-{*N*-(2-aminoethyl)-*N*-(3-aminopropyl)glycinato} dinitrocobalt(III) hydrate and *mer*-(1,6-diamino-3-azahexane)trinitrocobalt(III)

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Abstract—X-ray structure analyses have been made on single crystals of *trans*-[Co(3,3-ma)$(NO_2)_2$]·H_2O (**1**), *mer*(*N*)-[Co(2,3-ma)$(NO_2)_2$]·1.5H_2O (**2**), *mer*(*N*)-[Co(i-2,3-ma)$(NO_2)_2$]·H_2O (**3**) and *mer*-[Co$(NO_2)_3$ (2,3-tri)] (**4**); where H(3,3-ma) stands for 10-amino-3,7-diazadecanoic acid $H_2NCH_2CH_2CH_2NHCH_2$ $CH_2CH_2NHCH_2$ COOH, H(2,3-ma) for 9-amino-3,7-diazanonanoic acid $H_2NCH_2CH_2NHCH_2CH_2CH_2NHCH_2COOH$, H(i-2,3-ma) for *N*-(2-aminoethyl)-*N*-(3-aminopropyl)glycine $(H_2NCH_2CH_2)N(CH_2CH_2CH_2NH_2)CH_2COOH$ and 2,3-tri for 1,6-diamino-3-azahexane. **1**, **3** and **4** crystallize as a racemate in a monoclinic space group $P2_1/n$, **2** as a racemate in a triclinic space group $P\bar{1}$. In **1**, the two nitro ligands coordinate to cobalt(III) at the *trans* position of the octahedron. In **2**, **3** and **4**, the polydentates coordinate to cobalt(III) with their three amino nitrogen atoms on a meridian of the octahedron. In these complexes, the trimethylenediamine rings assume the chair structure and the nitro ligand planes are anchored by intermolecular and intramolecular hydrogen bonds to amine protons or to protons of the water of crystallization. © 1997 Elsevier Science Ltd

Keywords: crystal structure; dinitrocobalt(III) complex; 9-amino-3,7-diazanonatocobalt(III); 10-amino-3,7-diazadecanoatocobalt(III); *N*-(2-aminoethyl)-*N*-(3-aminopropyl)glycinatocobalt(III).

Cobalt(III) complexes have been extensively studied this century with variation of ligands occupying the coordination octahedron. However, cobalt(III) complexes with uninegative quadridentate ligands have not been studied as much. Only those with 1-dtma, i-dtma, 1-dtmp and 4-dtmp have been studied; where we abbreviate 8-amino-3,6-diazaoctanoic acid as H(1-dtma) [1], *N*,*N*-bis(2-aminoethyl)glycine as H(i-dtma) [2], 9-amino-4,7-diazanonanoic acid as H(1-dtmp), and *N*,*N*-bis(2-aminoethyl)-*β*-alanine as H(4-dtmp) [3]. From this viewpoint, we have projected to study cobalt(III) complexes with further variation of ligands of this type. We have recently described the preparations and the X-ray structure analyses for cobalt(III) complexes bearing uninegative tripod quadridentate 5-dptma, where we abbreviate *N*,*N*-bis(3-aminopropyl)glycine as H(5-dptma) [4,5]. In the present report, we describe the preparations and the X-ray structure analyses for dinitrocobalt(III) complexes bearing uninegative quadridentate ligand; linear 10-amino-3,7-diazadecanoate $H_2NCH_2CH_2CH_2NHCH_2CH_2CH_2NHCH_2COO^-$ (3,3-ma), linear 9-amino-3,7-diazanonanoate $H_2NCH_2CH_2NHCH_2CH_2CH_2NHCH_2COO^-$ (2,3-ma) or tripod *N*-(2-aminoethyl)-*N*-(3-aminopropyl)glycinate $(H_2NCH_2CH_2)N(CH_2CH_2CH_2NH_2)CH_2COO^-$ (i-2,3-ma): *trans*-[Co(3,3-ma)$(NO_2)_2$]·H_2O (**1**), *mer*(*N*)-[Co(2,3-ma)$(NO_2)_2$]·1.5H_2O (**2**) and *mer*(*N*)-[Co(i-2,3-ma)$(NO_2)_2$]·H_2O (**3**). In the preparative trial for **2**, we

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Table 1. Crystal data, experimental conditions and refinement details of *trans*-[Co(3,3-ma)$(NO_2)_2$]H_2O (**1**), *mer*(*N*)-[Co(2,3-ma)$(NO_2)_2$]·1.5H_2O (**2**), *mer*(*N*)-[Co(i-2,3-ma)$(NO_2)_2$·H_2O (**3**) and *mer*-[Co$(NO_2)_3$(2,3-tri)] (**4**)

	1	**2**	**3**	**4**
Formula	$C_8H_{20}N_5O_7Co$	$C_7H_{20}N_5O_8Co$	$C_7H_{18}N_5O_7Co$	$C_5H_{15}N_6O_6Co$
Formula weight	357.21	361.20	343.18	314.14
Crystal system	monoclinic	triclinic	monoclinic	monoclinic
a (Å)	7.661 (2)	8.418 (2)	8.729 (1)	10.516 (3)
b (Å)	14.697 (3)	11.316 (2)	10.101 (2)	8.185 (1)
c (Å)	12.812 (4)	7.694 (2)	14.365 (2)	14.106 (3)
α (°)		89.96 (2)		
β (°)	104.56 (2)	91.09 (2)	91.67 (1)	103.03 (2)
γ (°)		78.34 (2)		
V (Å^3)	1396.2 (6)	717.6 (3)	1266.2 (3)	1182.9 (5)
Space group	$P2_1/c$	$P\bar{1}$	$P2_1/c$	$P2_1/c$
Z	4	2	4	4
D_c (g cm^{-3})	1.699	1.671	1.800	1.764
F(000)	744	376	712	648
Color of crystal, Habit	red, prismatic	red-yellow, plate	red-brown, prismatic	yellow, prismatic
Size of crystal (mm)	0.450 × 0.230 × 0.200	0.300 × 0.200 × 0.050	0.500 × 0.150 × 0.130	0.200 × 0.100 × 0.200
μ (Mo-Kα) (cm^{-1})	12.65	12.36	13.92	14.77
Range of 2θ (°)	4.7 ~ 55	4.7 ~ 55	4.7 ~ 55	4.7 ~ 55
No. of unique reflections measured	3341	3278	3084	2916
No. of reflections observed [$I > 3\sigma(I)$]	2416	2322	1965	1617
R, R_w	0.032 ; 0.035	0.038 ; 0.039	0.033 ; 0.036	0.040 ; 0.037
S (goodness of fit)	1.28	1.23	1.49	1.26
Range of (Δ/ρ) (eÅ^{-3})	−0.25 ~ 0.25	−0.53 ~ 0.60	−0.45 ~ 0.35	−0.38 ~ 0.43

have obtained unexpectedly *mer*-[Co$(NO_2)_3$(2,3-tri)] (**4**), where we abbreviate 1,6-diamino-3-azahexane as 2,3-tri. We also describe the X-ray structure analysis for **4**, since it has not been reported hitherto. We are interested in the molecular structures of **1, 2** and **3** with new quadridentate ligands. We are also interested in the crystallization behaviours of these complexes from the viewpoint that a dinitrocobalt(III) complex often crystallizes as a conglomerate (homochiral crystals) [6].

EXPERIMENTAL

Trans-[Co(3,3-ma)$(NO_2)_2$]·H_2O (**1**)

A mixture of chloroacetic acid (41.4 g, 0.44 mol), NaOH (35.2 g, 0.88 mol) and water (100 cm^3) was combined with a mixture of 3,3-tri (52.5 g, 0.4 mol) and water (100 cm^3), where we abbreviate 1,7-diamino-4-azaoctane as 3,3-tri. In these procedures, the temperature was kept below 20°C using an ice bath. The solution was refluxed at 140°C for 8 days. A mixture of $CoCl_2 \cdot 6H_2O$ (96 g, 0.4 mol), $NaNO_2$ (69 g, 1 mol) and water (100 cm^3) was oxidized by air-bubbling, while the above-mentioned solution and acetic acid (24 g, 0.4 mol) were added alternatively little by little to the mixture. It was oxidized by air-bubbling for additional 4 h. The resultant orange–yellow solid (48 g) was separated and washed with ethanol and ether. This powder substance (5 g) was dispersed in boiling water (100 cm^3) and the dispersion was stirred for 10 min. Insoluble yellow solid was removed and the filtrate was kept in a refrigerator for 2 days. A red–orange solid (1.7 g) was obtained and recrystallized from water in a refrigerator. Found : C, 27.2; H, 5.7; N, 19.8. Calc.: C, 26.9; H, 5.7; N, 19.6%. A portion of this batch was recrystallized again from water in a refrigerator. One crystal was picked out therefrom and used for the X-ray analysis.

Mer(N)-[Co(2,3-ma)$(NO_2)_2$]·1.5H_2O (**2**)

This red–orange solid substance was prepared analogously to **1**, where 2,3-tri (46.8 g, 0.4 mol) was used

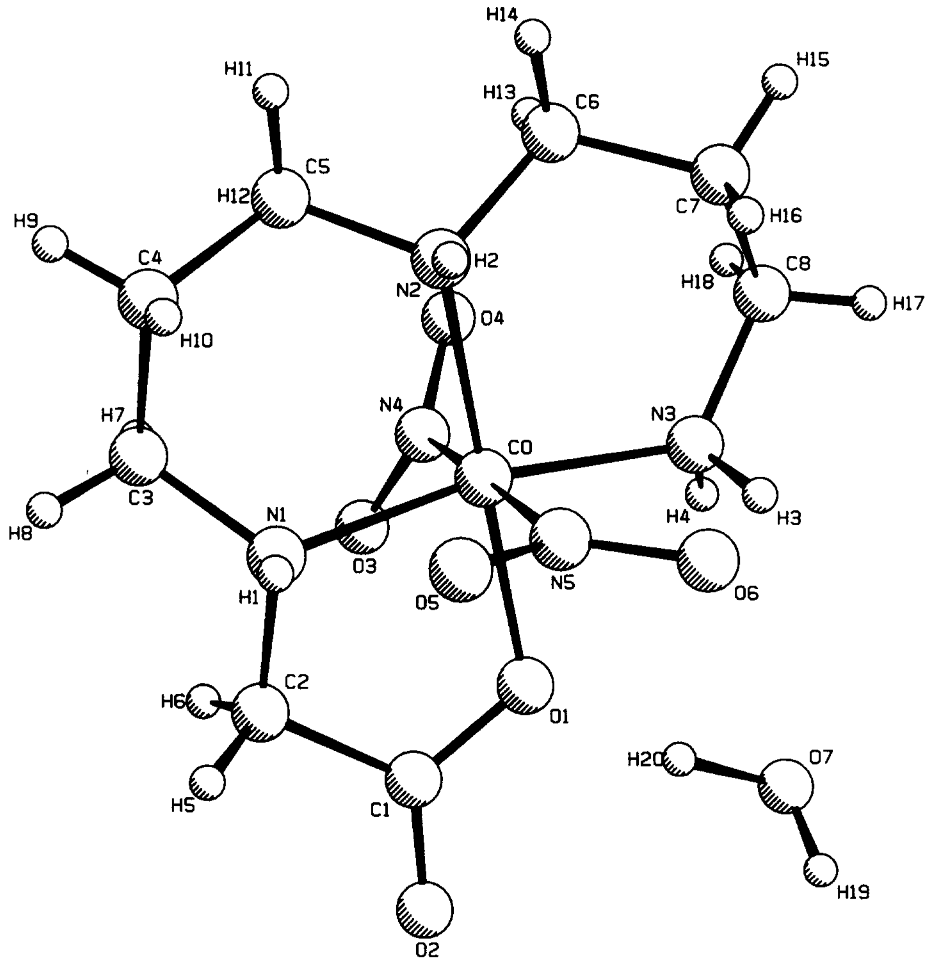

Fig. 1. Molecular structure of *trans*-[Co(3,3-ma)$(NO_2)_2$]H_2O (**1**) and the atomic numbering system.

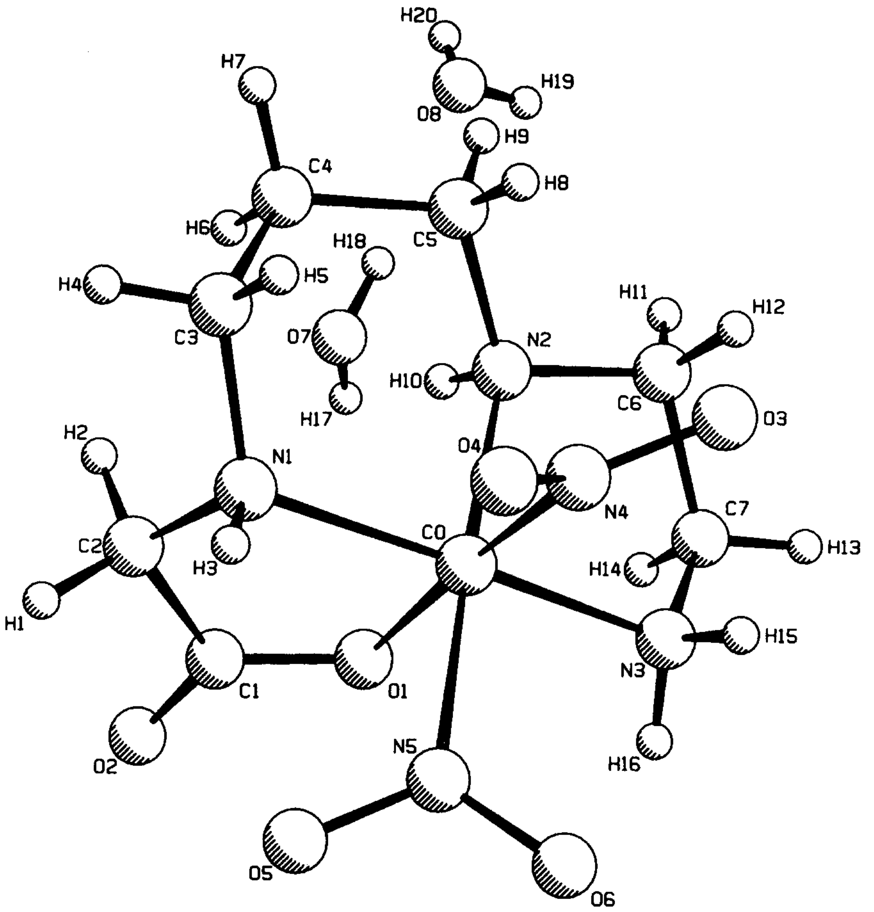

Fig. 2. Molecular structure of *mer*(*N*)-[Co(2,3-ma)$(NO_2)_2$] · $1.5H_2O$ (**2**) and the atomic numbering system.

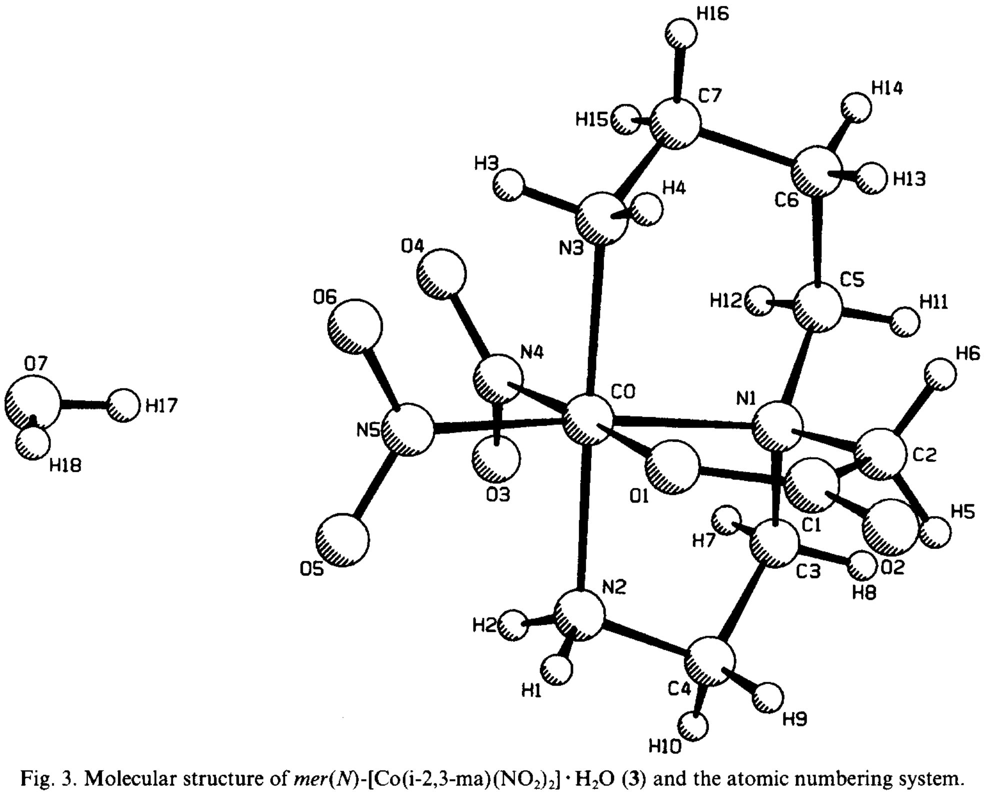

Fig. 3. Molecular structure of *mer*(*N*)-[Co(i-2,3-ma)$(NO_2)_2$] · H_2O (**3**) and the atomic numbering system.

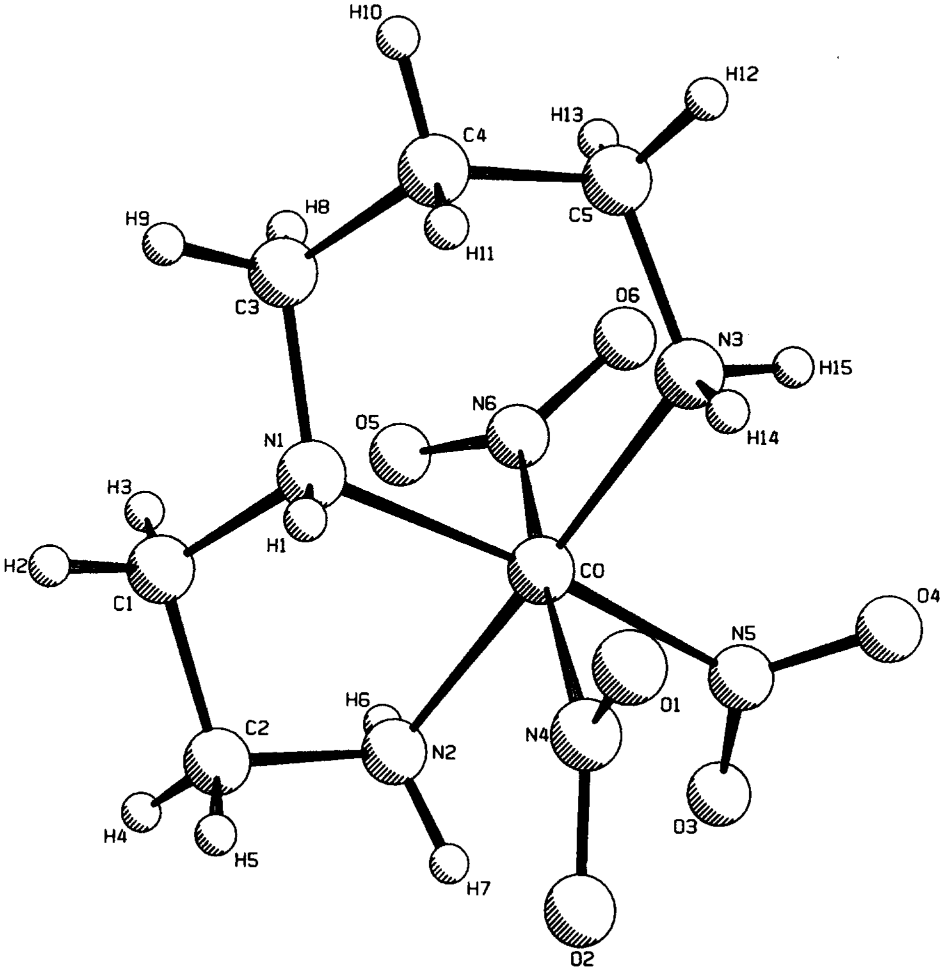

Fig. 4. Molecular structure of *mer*-[Co$(NO_2)_3$(2,3-tri)] (**4**) and the atomic numbering system.

instead of 3,3-tri. Found: C, 23.9; H, 4.6; N, 19.5. Calc.: C, 23.9; H, 4.5; N, 19.9%.

Mer(N)-[Co(i-2,3-ma)$(NO_2)_2$]H_2O (3)

This brown solid substance (42 g, 0.12 mol) was prepared analogously to *mer*(*N*)-[Co(5-dptma)$(NO_2)_2$] (**5**) using 2,3-tri (100 g, 0.85 mol) instead of 3,3-tri [4]. It was recrystallized from water in a refrigerator. Found: C, 24.5; H, 5.3; N, 19.7. Calc.: C, 24.5; H, 5.3; N, 20.4%.

Mer-[Co$(NO_2)_3$(2,3-tri)] (4)

This yellow solid substance was obtained in the preparative trial for **2**, where the reflux was carried out at 140°C for 5 h. It was recrystallized from boiling water in a refrigerator.

CAUTION! Although we have experienced no difficulty with the cobalt(III) complexes reported here, these should be regarded as potentially explosive and handled accordingly.

Structure determinations were carried out as described elsewhere [2]. The refinement details are shown in Table 1. In the case of **2**, the temperature factor for O(8) is larger (9.0). We interpret this value as an indication that this water of crystallization is partly lacking, which is consistent with the analytical result of sesquihydrate.

RESULTS AND DISCUSSION

The preparative courses for **1** and **2** are analogous to that for [Co(1-dtma)$(NO_2)_2$] [7]. Although we could not isolate the quadridentate ligand acid H(3,3-ma), H(2,3-ma) nor H(i-2,3-ma) the dinitro complexes **1**, **2** and **3** were obtained owing to their sparse solubility in water. The reaction velocity between chloracetic acid and 3,3-tri or 2,3-tri is slow. The ligand 3,3-ma or 2,3-ma is formed after reflux at 140°C for 8 days. Thus, in the preparative trial for **2**, insufficient reflux led to the formation of **4**. The yellow by-product in the procedure for **1** may consist of [Co$(NO_2)_3$(3,3-tri)] and that in the procedure for **2** may consist of **4**. These impurities were removed owing to their sparse solubility in boiling water.

The molecular structures of **1**, **2**, **3** and **4** are shown in Figs 1, 2, 3 and 4 respectively with atomic numbering systems. The bond lengths and angles are tabulated in Tables 2 and 3. The hydrogen bonds are listed in Table 4. In **1**, and 3,3-ma quadridentate coordinates to cobalt(III) with its four coordinating atoms approximately on one plane. In **2**, **3** and **4**, the polydentate coordinates to cobalt(III) with the three amine nitrogen atoms on a meridian of the octahedron.

Table 2. Bond lengths (Å) and angles (°) for **1**, **2** and **3**

	1	**2**	**3**
Co—O(1)	1.912(2)	1.927(2)	1.912(2)
Co—N(1)	1.972(2)	1.968(3)	2.011(3)
Co—N(2)	1.999(2)	1.970(3)	1.966(3)
Co—N(3)	1.969(2)	1.942(3)	1.960(3)
Co—N(4)	1.934(2)	1.906(3)	1.938(3)
Co—N(5)	1.987(2)	1.928(3)	1.930(3)
O(1)—C(1)	1.292(3)	1.284(4)	1.285(4)
O(2)—C(1)	1.216(3)	1.233(4)	1.226(4)
N(1)—C(2)	1.482(3)	1.481(4)	1.491(4)
N(1)—C(3)	1.484(3)	1.494(4)	1.505(4)
N(1)—C(5)			1.494(4)
N(2)—C(4)			1.479(4)
N(2)—C(5)	1.491(3)	1.489(4)	
N(2)—C(6)	1.498(3)	1.485(4)	
N(3)—C(7)		1.480(5)	1.486(4)
N(3)—C(8)	1.480(3)		
C(1)—C(2)	1.581(4)	1.516(5)	1.516(5)
C(3)—C(4)	1.506(4)	1.503(5)	1.514(5)
C(4)—C(5)	1.513(4)	1.505(6)	
C(5)—C(6)			1.511(5)
C(6)—C(7)	1.505(4)	1.500(5)	1.510(5)
C(7)—C(8)	1.499(4)		
O(3)—N(4)	1.232(3)	1.231(4)	1.237(4)
O(4)—N(4)	1.228(3)	1.235(4)	1.228(3)
O(5)—N(5)	1.233(3)	1.238(4)	1.212(4)
O(6)—N(5)	1.229(3)	1.227(4)	1.227(4)
O(1)—Co—N(1)	85.1(8)	86.3(1)	86.1(1)
O(1)—Co—N(2)	174.6(8)	90.1(1)	89.2(1)
O(1)—Co—N(3)	84.2(8)	88.2(1)	89.2(1)
O(1)—Co—N(4)	91.4(9)	175.6(1)	175.7(1)
O(1)—Co—N(5)	85.7(8)	87.6(1)	86.5(1)
N(1)—Co—N(2)	93.5(9)	92.3(1)	85.8(1)
N(1)—Co—N(3)	169.0(9)	174.1(1)	93.3(1)
N(1)—Co—N(4)	92.7(9)	94.0(1)	98.0(1)
N(1)—Co—N(5)	87.9(9)	91.1(1)	171.9(1)
N(2)—Co—N(3)	96.9(9)	85.8(1)	178.3(1)
N(2)—Co—N(4)	93.9(9)	94.3(1)	90.1(1)
N(2)—Co—N(5)	89.0(1)	175.8(1)	90.7(1)
N(3)—Co—N(4)	90.8(9)	91.7(1)	91.5(1)
N(3)—Co—N(5)	88.5(9)	90.6(1)	90.0(1)
N(4)—Co—N(5)	176.9(9)	88.0(1)	89.3(1)
Co—O(1)—C(1)	116.9(2)	114.6(2)	116.8(2)
Co—N(1)—C(2)	108.8(2)	108.9(2)	107.4(2)
Co—N(1)—C(3)	120.3(2)	118.7(2)	105.4(2)
Co—N(1)—C(5)			115.9(2)
C(2)—N(1)—C(3)	112.0(2)	112.3(3)	109.0(2)
C(2)—N(1)—C(5)			110.3(2)
C(3)—N(1)—C(5)			108.5(3)
Co—N(2)—C(4)			111.2(2)
Co—N(2)—C(5)	116.8(2)	118.5(2)	
Co—N(2)—C(6)	118.6(2)	109.3(2)	
C(5)—N(2)—C(6)	107.1(2)	111.5(3)	
Co—N(3)—C(7)		109.6(2)	122.4(2)
Co—N(3)—C(8)	123.9(2)		
Co—N(4)—O(3)	120.0(2)	121.6(2)	120.7(2)
Co—N(4)—O(4)	120.7(2)	119.0(2)	120.4(2)
O(3)—N(4)—O(4)	119.3(2)	119.5(3)	118.8(3)
Co—N(5)—O(5)	120.3(2)	121.2(2)	120.1(3)
Co—N(5)—O(6)	121.8(2)	119.8(2)	121.5(2)
O(5)—N(5)—O(6)	117.8(2)	119.0(3)	118.4(3)
O(1)—C(1)—O(2)	123.9(2)	124.3(3)	124.4(3)

Table 2.–*Continued*

O(1)—C(1)—C(2)	115.1(2)	116.2(3)	116.1(3)
O(2)—C(1)—C(2)	121.0(3)	119.5(3)	119.5(3)
N(1)—C(2)—C(1)	111.3(2)	111.5(3)	113.1(3)
N(1)—C(3)—C(4)	110.0(2)	113.8(3)	107.8(3)
N(2)—C(4)—C(3)			108.1(3)
N(1)—C(5)—C(6)			114.4(3)
C(5)—C(6)—C(7)			113.8(3)
C(3)—C(4)—C(5)	113.6(2)	114.7(3)	
N(2)—C(5)—C(4)	114.0(2)	111.9(3)	
N(2)—C(6)—C(7)	114.7(2)	107.1(3)	
C(6)—C(7)—C(8)	112.8(3)		
N(3)—C(7)—C(6)		107.6(3)	112.3(3)
N(3)—C(8)—C(7)	111.8(2)		

Table 3. Bond lengths (Å) and angles (°) for **4**

Co—N(1)	1.998(3)
Co—N(2)	1.943(4)
Co—N(3)	1.965(4)
Co—N(4)	1.951(4)
Co—N(5)	1.926(4)
Co—N(6)	1.934(4)
N(1)—C(1)	1.493(5)
N(1)—C(3)	1.472(6)
N(2)—C(2)	1.471(5)
N(3)—C(5)	1.486(6)
C(1)—C(2)	1.510(7)
C(3)—C(4)	1.504(7)
C(4)—C(5)	1.499(7)
O(1)—N(4)	1.239(5)
O(2)—N(4)	1.228(5)
O(3)—N(5)	1.202(5)
O(4)—N(5)	1.200(5)
O(5)—N(6)	1.228(5)
O(6)—N(6)	1.224(5)
N(1)—Co—N(2)	84.6(2)
N(1)—Co—N(3)	92.5(1)
N(1)—Co—N(4)	89.9(1)
N(1)—Co—N(5)	174.6(2)
N(1)—Co—N(6)	95.0(2)
N(2)—Co—N(3)	176.7(2)
N(2)—Co—N(4)	88.9(2)
N(2)—Co—N(5)	90.8(2)
N(2)—Co—N(6)	90.7(2)
N(3)—Co—N(4)	89.5(2)
N(3)—Co—N(5)	92.1(2)
N(3)—Co—N(6)	91.1(2)
N(4)—Co—N(5)	87.3(2)
N(4)—Co—N(6)	175.0(2)
N(5)—Co—N(6)	87.7(2)
Co—N(1)—C(1)	109.1(3)
Co—N(1)—C(3)	118.8(3)
C(1)—N(1)—C(3)	111.9(4)
Co—N(2)—C(2)	111.7(3)
Co—N(3)—C(5)	121.1(3)
Co—N(4)—O(1)	120.3(3)
Co—N(4)—O(2)	121.6(3)
O(1)—N(4)—O(2)	118.1(4)
Co—N(5)—O(3)	119.6(4)
Co—N(5)—O(4)	122.3(4)
O(3)—N(5)—O(4)	118.1(5)
Co—N(6)—O(5)	121.5(3)
Co—N(6)—O(6)	120.3(3)
O(5)—N(6)—O(6)	118.1(4)
N(1)—C(1)—C(2)	107.1(3)
N(2)—C(2)—C(1)	106.9(4)
N(1)—C(3)—C(4)	111.3(4)
C(3)—C(4)—C(5)	114.3(4)
N(3)—C(5)—C(4)	111.1(4)

1, **2**, **3** and **4** crystallize in space groups with a center of symmetry as racemates. For the positively charged dinitrotetraamine cobalt(III) complexes, it has been pointed out that intramolecular hydrogen bonds between the nitro ligands and the adjacent amine proton lead to conglomerate formation, whereas blocking of such hydrogen bonds by counter anions leads to racemate formation [6]. The complexes **1**, **2**, **3** and **4** are nonelectrolyte and therefore lacks counter anion. In these, the nitro ligand planes are anchored by intermolecular or intramolecular hydrogen bonds to amine protons or to proton of the water of crystallization (Table 4). Thus, among seven hitherto known nonelectrolyte cobalt(III) complexes with dinitro and trinitro ligands **1**, **2**, **3**, **4**, **5**, *mer*-[Co$(NO_2)_3$(dien)] (**6**) and *mer*-[Co$(NO_2)_3(NH_3)_3$], only the last one crystallizes as a conglomerate, where we abbreviate 1,5-diamino-3-azapentane as dien [5,8,9].

The coordination octahedrons of **1**, **2**, **3** and **4** are deformed more or less. The Co—amine bond distances in these complexes are distributed in the range 1.9–2.0 Å and are normal or within the experimentally found values for Co—amine bonds in analogous cobalt(III) complexes [1,2,3,5,6,8,9,10]. In **1**, the Co—N(1) distance is approximately equal to the Co—N(3) distance and is shorter than the Co—N(2) distance: Co—N(1) $\fallingdotseq$ Co—N(3) < Co—N(2). In **2**, Co—N(3) < Co—N(1) $\fallingdotseq$ Co—N(2); in **3**, Co—N(2) $\fallingdotseq$ Co—N(3) < Co—N(1) and in **4**, Co—N(2) < Co—N(3) < Co—N(1). The Co—N(O_2) bond distances are distributed in the range 1.9–2.0 Å and are normal [5,6,8,9,10]. In **1** and **2**, Co—N(4) < Co—N(5); in **3**, Co—N(4) $\fallingdotseq$ Co—N(5). In **4**, Co—N(5) < Co—N(6) < Co—N(4). The short Co—N(O_2) distance *trans* to the secondary amine has been also observed in **6** [8]. The Co—O (carboxymethyl) bond distances about 1.9 Å in **1**, **2** and **3** are normal [1,2,3,5]. All the trimethylenediamine chelate rings in these complexes assume the chair conformation with normal N—Co—N angle 93–97° [5,10]. The N—Co—N angle about 85° for the ethylenediamine chelate rings in **2**, **3** and **4** are also normal [1,2,3,6,8,10]. Thus, the N(2)—Co—N(3) angle (177°) in **4** contrasts with the corresponding angle (170°) in **6** [8]. The O(1)—Co—N(1) angle about 86° of the glycinato chelate rings in **1**, **2** and **3** are normal [1,2,5]. The water molecule of crystallization forms two strong hydrogen bonds in **1** and **2**, and weak hydrogen bond in **3**.

Table 4. Hydrogen bond distance (Å)

1	**2**	**3**	**4**
Intermolecular			
0(5)···H(4)—N(3) 2.98[a]	O(2)···H(17)—O(7) 2.80[a]	O(2)···H(18)—O(7) 2.87[a]	O(6)···H(6)—N(2) 3.23[a]
0(2)···H(19)—O(7) 2.79[a]	O(2)···H(19)—O(8) 2.82[a]	O(7)···H(3)—N(3) 3.06[a]	
O(3)···H(1)—N(1) 3.52[a]	O(4)···H(3)—N(1) 2.99		
	O(6)···H(19)—O(8) 2.96		
Intramolecular			
O(1)···H(20)—O(7) 2.83[a]	O(3)···H(15)—N(3) 2.87	O(3)···H(2)—N(2) 2.77	O(1)···H(14)—N(3) 2.78
O(5)···H(1)—N(1) 2.73	O(4)···H(3)—N(1) 2.93	O(5)···H(1)—N(2) 2.72	O(2)···H(7)—N(2) 2.80
O(6)···H(3)—N(3) 2.75	O(5)···H(3)—N(1) 2.83	O(6)···H(3)—N(3) 2.73	O(3)···H(7)—N(2) 2.71
	O(6)···H(16)—N(3) 2.80	O(6)···H(17)—O(7) 3.10[a]	O(4)···H(15)—N(3) 2.81
	O(7)···H(10)—N(2) 2.86[a]		O(5)···H(6)—N(2) 2.82
	O(8)···H(18)—O(7) 2.71[a]		

[a] The three atoms align approximately on one line.

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