

Додаток А

Довжини зв'язків і валентні кути в структурах комплексів **1-27** та деякі рисунки структур комплексів купруму(I) з тіоамідними лігандами (**21-25**).

Таблиця А.1

Основні довжини зв'язків (d) та валентні кути (ω) в структурах π -комплексів **1-3**, що містять азометинові співліганди.

Зв'язок	d , Å	Кут	ω , °
сполука 1 , $[\text{Cu}\{(\text{C}_9\text{H}_{11}\text{CH}=\text{N})_2\text{C}_6\text{H}_{10}\}(\text{Ph}-\text{CH}=\text{CH}_2)]\text{PF}_6$			
Cu-C(1)	2.00(1)	N(1)-Cu-N(2)	83.1(4)
Cu-C(2)	2.05(1)	C(1)-Cu-C(2)	38.7(5)
Cu- <i>m</i>	1.91(1)		
Cu-N(1)	2.00(1)	N(1)-Cu- <i>m</i>	137.4(5)
Cu-N(2)	1.99(1)	N(2)-Cu- <i>m</i>	139.0(5)
C(1)-C(2)	1.34(2)		
N(1)-C(15)	1.28(2)	Cu-N(1)-C(15)	128.2(8)
N(2)-C(25)	1.29(2)	Cu-N(2)-C(25)	121(1)
сполука 2 , $[\text{Cu}(2\text{-гiдроксигiноксалiн})_2(\text{CH}_2=\text{CH}_2)]\text{ClO}_4$			
Cu-N(1)	2.013(4)	N(1)-Cu-N(1a)	102.5(2)
Cu-C(9)	2.046(6)	C(9)-Cu-C(9a)	37.5(3)
Cu- <i>m</i>	1.937(5)	N(1)-Cu- <i>m</i>	128.8(2)
C(9)-C(9a)	1.31(1)	Cu-N(1)-C(1)	119.8(4)
C(1)-C(2)	1.458(7)	Cu-N(1)-C(8)	121.7(3)
сполука 3 , $[\text{Cu}_2\{(\text{C}_3\text{H}_5-\text{CH}_2-\text{N}=\text{C}(\text{CH}_3))_2\text{C}_5\text{H}_3\text{N}\}_2][\text{BPh}_4]_2$			
Cu(1)-C(1A)	2.06(3)	N(8B)-Cu(1)- <i>m</i> (1)	141(1)
Cu(1)-C(2A)	2.13(4)	N(11B)-Cu(1)- <i>m</i> (1)	127(1)
Cu(1)- <i>m</i> (1)	1.99(4)	N(5A)-Cu(1)- <i>m</i> (1)	89(1)
Cu(1)-N(8B)	1.93(3)	N(8B)-Cu(1)-N(11B)	78(1)
Cu(1)-N(11B)	1.98(4)	N(8B)-Cu(1)-N(5A)	112(1)
Cu(1)-N(5A)	2.20(2)	N(11B)-Cu(1)-N(5A)	106.7(9)
C(1A)-C(2A)	1.29(5)	C(1A)-Cu(1)-C(2A)	35.9(14)

Продовження табл. А.1

Зв'язок	$d, \text{Å}$	Кут	$\omega, ^\circ$
Cu(2)-C(1B)	2.31(6)	N(8A)-Cu(2)- <i>m</i> (2)	125(2)
Cu(2)-C(2B)	2.07(5)	N(11A)-Cu(2)- <i>m</i> (2)	131(2)
Cu(2)- <i>m</i> (2) ¹	2.06(5)	N(5B)-Cu(2)- <i>m</i> (2)	102(2)
Cu(2)-N(8A)	1.94(3)	N(8A)-Cu(2)-N(11A)	77(1)
Cu(2)-N(11A)	1.97(4)	N(8A)-Cu(2)-N(5B)	116(1)
Cu(2)-N(5B)	2.11(3)	N(11A)-Cu(2)-N(5B)	105(1)
C(1B)-C(2B)	1.48(8)	C(1B)-Cu(2)-C(2B)	39(2)

Таблиця А.2

Основні довжини зв'язків (d) та валентні кути (ω) в структурах купрогалогенідних π -комплексів **4**, **5**, **8-12** та **17** з протонованими азотистими основами.

Зв'язок	$d, \text{Å}$	Кут	$\omega, ^\circ$
сполука 4 , [Cu ^I Cl ₂ (C ₃ H ₅ -NH ₃)]			
Cu-Cl(1)	2.2794(3)	Cl(1)-Cu-Cl(2)	106.89(4)
Cu-Cl(2)	2.2757(3)	Cl(1)-Cu- <i>m</i>	126.35(6)
Cu-Cl(1)'	2.7650(3)	Cl(2)-Cu- <i>m</i>	123.26(5)
Cu-C(1)	2.055(1)	Cl(1)'-Cu-Cl(1)	92.19(4)
Cu-C(2)	2.073(1)	Cl(1)'-Cu-Cl(2)	99.05(3)
Cu- <i>m</i>	1.950(1)	Cl(1)'-Cu- <i>m</i>	97.24(6)
C(1)-C(2)	1.352(2)	C(1)-Cu-C(2)	38.24(6)
сполука 5 , [Cu ^I Br ₂ (C ₃ H ₅ -NH ₃)]			
Cu(1)-Br(1)	2.385(2)	Br(1)-Cu(1)-Br(2)	111.1(1)
Cu(1)-Br(2)	2.372(2)	Br(1)-Cu(1)- <i>m</i> (1)	124.9(2)
Cu(1)...Br(4)	3.342(2)	Br(2)-Cu(1)- <i>m</i> (1)	123.9(2)
Cu(1)-C(1)	2.055(7)	Br(4)...Cu(1)-Br(1)	97.2(1)
Cu(1)-C(2)	2.083(8)	Br(4)...Cu(1)-Br(2)	85.6(1)
Cu(1)- <i>m</i> (1)	1.957(8)	Br(4)...Cu(1)- <i>m</i> (1)	90.1(2)
C(1)-C(2)	1.34(1)	C(1)-Cu(1)-C(2)	37.9(3)

Продовження табл. А.2

Зв'язок	$d, \text{\AA}$	Кут	$\omega, ^\circ$
Cu(2)-Br(2)	2.830(2)	Br(2)-Cu(2)-Br(3)	98.14(8)
Cu(2)-Br(3)	2.410(2)	Br(2)-Cu(2)-Br(4)	97.45(8)
Cu(2)-Br(4)	2.407(2)	Br(2)-Cu(2)- <i>m</i> (2)	98.3(2)
Cu(2)-C(4)	2.060(7)	Br(3)-Cu(2)-Br(4)	110.27(9)
Cu(2)-C(5)	2.115(7)	Br(3)-Cu(2)- <i>m</i> (2)	122.6(2)
Cu(2)- <i>m</i> (1)	1.977(7)	Br(4)-Cu(2)- <i>m</i> (2)	121.3(2)
C(4)-C(5)	1.35(1)	C(4)-Cu(2)-C(5)	37.5(3)
сполука 8 , $[\text{Cu}^{\text{I}}_2\text{Cl}_3(\text{C}_3\text{H}_5\text{-NH}_3)_2]\text{CuCl}_2$			
Cu(1)-Cl(2)	2.129(2)	Cl(2)-Cu(1)-Cl(2)'	180.00(9)
Cu(2)-Cl(1)	2.288(2)	Cl(1)-Cu(2)-Cl(3)	107.46(9)
Cu(2)-Cl(3)	2.242(3)	Cl(1)-Cu(2)- <i>m</i>	126.4(3)
Cu(2)-Cl(1)'	3.079(1)	Cl(3)-Cu(2)- <i>m</i>	125.3(4)
Cu(2)-C(1)	2.067(9)	Cl(1)-Cu(2)-Cl(1)'	93.18(7)
Cu(2)-C(2)	2.04(1)	Cl(1)'-Cu(2)-Cl(3)	96.06(8)
Cu(2)- <i>m</i>	1.94(1)	Cl(1)'-Cu(2)- <i>m</i>	90.4(3)
C(1)-C(2)	1.39(2)	C(1)-Cu(2)-C(2)	39.6(6)
сполука 9 , $[\text{Cu}^{\text{I}}\text{Cl}_2(\text{C}_3\text{H}_5\text{-NH}_2\text{-C}_3\text{H}_5)]$			
Cu-Cl(1)	2.624(2)	Cl(1)-Cu-Cl(2)	99.30(8)
Cu-Cl(2)	2.260(3)	Cl(1)-Cu- <i>m</i>	103.5(2)
Cu-Cl(1)'	2.401(2)	Cl(2)-Cu- <i>m</i>	127.1(2)
Cu-C(1)	2.02(1)	Cl(1)'-Cu-Cl(1)	96.39(8)
Cu-C(2)	2.07(1)	Cl(1)'-Cu-Cl(2)	103.36(9)
Cu- <i>m</i>	1.96(1)	Cl(1)'-Cu- <i>m</i>	120.4(3)
C(1)-C(2)	1.21(1)	C(1)-Cu-C(2)	34.0(4)
сполука 10 , $[\text{Cu}^{\text{I}}\text{Br}_2(\text{C}_3\text{H}_5\text{-NH}_2\text{-C}_3\text{H}_5)]$			
Cu-Br(1)	2.405(2)	Br(1)-Cu-Br(2)	108.99(7)
Cu-Br(2)	2.382(2)	Br(1)-Cu- <i>m</i>	122.1(3)
Cu-Br(1)'	3.051(2)	Br(2)-Cu- <i>m</i>	125.1(3)

Продовження табл. А.2

Зв'язок	$d, \text{Å}$	Кут	$\omega, ^\circ$
Cu-C(1)	2.08(1)	Br(1)'-Cu-Br(1)	98.71(6)
Cu-C(2)	2.08(1)	Br(1)'-Cu-Br(2)	99.33(6)
Cu- <i>m</i>	1.98(1)	Br(1)'-Cu- <i>m</i>	91.7(3)
C(1)-C(2)	1.34(2)	C(1)-Cu-C(2)	37.53(9)
сполука 11 , $[\text{Cu}_2^{\text{I}}\text{Cl}_3(\text{C}_3\text{H}_5\text{-NH}_2\text{-C}_3\text{H}_5)]$			
Cu(1)-Cl(1)	2.292(2)	Cl(1)-Cu(1)-Cl(1)'	95.94(6)
Cu(1)-Cl(3)	2.360(2)	Cl(1)-Cu(1)-Cl(3)	99.80(6)
Cu(1)-Cl(1)'	2.496(1)	Cl(1)''-Cu(1)-Cl(3)	99.64(6)
Cu(1)-C(1)	2.060(4)	Cl(1)-Cu(1)- <i>m</i> (1)	123.7(1)
Cu(1)-C(2)	2.092(4)	Cl(3)-Cu(1)- <i>m</i> (1)	122.0(1)
Cu(1)- <i>m</i> (1)	1.963(4)	Cl(1)''-Cu(1)- <i>m</i> (1)	110.5(1)
C(1)-C(2)	1.350(6)	C(1)-Cu(1)-C(2)	37.9(2)
Cu(2)-Cl(2)	2.307(2)	Cl(2)-Cu(2)-Cl(3)	103.28(6)
Cu(2)-Cl(3)	2.305(2)	Cl(2)-Cu(2)-Cl(2)'	101.82(6)
Cu(2)-Cl(2)'	2.569(1)	Cl(2)''-Cu(2)-Cl(3)	98.16(6)
Cu(2)-C(5)	2.101(4)	Cl(2)-Cu(2)- <i>m</i> (2)	125.6(1)
Cu(2)-C(6)	2.067(4)	Cl(3)-Cu(2)- <i>m</i> (2)	122.0(1)
Cu(2)- <i>m</i> (2)	1.971(4)	Cl(2)''-Cu(2)- <i>m</i> (2)	101.5(1)
C(5)-C(6)	1.353(6)	C(5)-Cu(2)-C(6)	37.9(2)
сполука 12 , $[\text{Cu}_2^{\text{I}}\text{Br}_3(\text{C}_3\text{H}_5\text{-NH}_2\text{-C}_3\text{H}_5)]$			
Cu(1)-Br(1)	2.505(5)	Br(1)-Cu(1)-Br(2)	101.8(2)
Cu(1)-Br(2)	2.596(4)	Br(1)-Cu(1)-Br(3)	103.9(2)
Cu(1)-Br(3)	2.406(5)	Br(1)-Cu(1)- <i>m</i> (1)	117.7(4)
Cu(1)-C(1)	2.09(1)	Br(2)-Cu(1)-Br(3)	99.7(2)
Cu(1)-C(2)	2.12(1)	Br(2)-Cu(1)- <i>m</i> (1)	108.2(3)
Cu(1)- <i>m</i> (1)	1.99(1)	Br(3)-Cu(1)- <i>m</i> (1)	123.3(4)
C(1)-C(2)	1.35(2)	C(1)-Cu(1)-C(2)	37.3(5)

Продовження табл. А.2

Зв'язок	$d, \text{Å}$	Кут	$\omega, ^\circ$
Cu(2)-Br(1)	2.520(5)	Br(1)-Cu(2)-Br(2)	101.2(2)
Cu(2)-Br(2)	2.422(5)	Br(1)-Cu(2)-Br(3)	103.0(2)
Cu(2)-Br(3)	2.575(4)	Br(1)-Cu(2)- <i>m</i> (2)	118.7(4)
Cu(2)-C(5)	2.12(1)	Br(2)-Cu(2)-Br(3)	99.8(2)
Cu(2)-C(6)	2.10(1)	Br(2)-Cu(2)- <i>m</i> (2)	122.4(4)
Cu(2)- <i>m</i> (2)	2.00(1)	Br(3)-Cu(2)- <i>m</i> (2)	108.5(4)
C(5)-C(6)	1.35(2)	C(5)-Cu(2)-C(6)	37.3(5)
сполука 17 , $[\text{Cu}^{\text{I}}\text{Cl}_2(\text{H}^+\text{C}_{12}\text{H}_{13}\text{NO})]\cdot\text{H}_2\text{O}$			
Cu-Cl(1)	2.253(1)	Cl(1)-Cu-Cl(2)	113.27(4)
Cu-Cl(2)	2.215(1)	Cl(1)-Cu- <i>m</i>	121.5(1)
Cu-Cl(1)'	2.738(1)	Cl(2)-Cu- <i>m</i>	120.5(1)
Cu-C(2)	2.065(3)	Cl(1)'-Cu-Cl(1)	92.77(3)
Cu-C(3)	2.051(3)	Cl(1)'-Cu-Cl(2)	102.40(4)
Cu- <i>m</i>	1.942(3)	Cl(1)'-Cu- <i>m</i>	96.6(1)
C(2)-C(3)	1.377(4)	C(2)-Cu-C(3)	39.1(1)

Таблиця А.3

Основні довжини зв'язків (d) та валентні кути (ω) в структурах π -комплексів

$[\text{Cu}^{\text{I}}\text{X}_9(\text{C}_3\text{H}_5\text{-NH}_2\text{-C}_3\text{H}_5)_2]\cdot\text{H}_2\text{O}$ X = Cl (**13**) та X = Br (**14**).

Зв'язок	d , Å		Кут	ω , °	
	13	14		13	14
Cu(1)-X(2)	2.398(7)	2.503(4)	X(2)-Cu(1)-X(6)	106.3(2)	109.6(2)
Cu(1)-X(5)	2.304(7)	2.426(4)	X(2)-Cu(1)-X(6)'	106.3(2)	109.6(1)
Cu(1)-X(6)	2.371(6)	2.489(2)	X(2)-Cu(1)-X(5)	118.1(2)	116.2(1)
Cu(1)-X(6)'	2.371(6)	2.489(2)	X(5)-Cu(1)-X(6)	104.6(2)	101.7(1)
			X(5)-Cu(1)-X(6)'	104.6(2)	101.7(1)
			X(6)-Cu(1)-X(6)'	117.7(2)	117.5(1)
Cu(2)-X(2)	2.417(6)	2.533(3)	X(2)-Cu(2)-X(4)	104.0(2)	109.1(1)
Cu(2)-X(4)	2.337(7)	2.475(3)	X(2)-Cu(2)-X(6)	102.9(2)	106.7(1)
Cu(2)-X(6)	2.462(5)	2.554(3)	X(2)-Cu(2)-X(7)	114.6(2)	110.3(1)
Cu(2)-X(7)	2.270(6)	2.422(3)	X(4)-Cu(2)-X(6)	108.2(2)	110.0(1)
			X(4)-Cu(2)-X(7)	124.2(2)	120.6(1)
			X(6)-Cu(2)-X(7)	100.9(2)	98.7(1)
Cu(3)-X(1)	2.412(6)	2.532(3)	X(1)-Cu(3)-X(5)	95.9(2)	97.6(1)
Cu(3)-X(5)	2.471(6)	2.589(3)	X(1)-Cu(3)-X(7)'	102.9(2)	103.3(1)
Cu(3)-X(7)'	2.298(5)	2.423(3)	X(1)-Cu(3)- m (1)	120.1(7)	121.5(4)
Cu(3)-C(2)	2.06(2)	2.11(2)	X(5)-Cu(3)-X(7)'	95.5(2)	95.4(1)
Cu(3)-C(3)	2.09(2)	2.07(2)	X(5)-Cu(3)- m (1)	109.6(7)	108.5(4)
Cu(3)- m (1)	1.97(2)	1.99(2)	X(7)' $-$ Cu(3)- m (1)	126.2(7)	124.1(4)
C(3)-C(2)	1.31(4)	1.34(3)	C(2)-Cu(3)-C(3)	36.7(7)	38.5(5)
Cu(4)-X(4)	3.018(7)	3.057(3)	X(4)-Cu(4)-X(3)	97.2(2)	96.7(1)
Cu(4)-X(3)	2.260(6)	2.395(3)	X(4)-Cu(4)-X(6)	93.4(2)	97.0(1)
Cu(4)-X(6)	2.280(5)	2.417(3)	X(4)-Cu(4)- m (2)	92.9(7)	93.9(4)
Cu(4)-C(5)	2.07(2)	2.10(1)	X(3)-Cu(4)-X(6)	108.6(2)	108.4(1)
Cu(4)-C(6)	2.09(2)	2.09(2)	X(3)-Cu(4)- m (2)	126.3(6)	126.4(4)
Cu(4)- m (2)	1.95(2)	1.99(2)	X(6)-Cu(4)- m (2)	123.4(6)	122.0(4)
C(6)-C(5)	1.40(3)	1.35(2)	C(5)-Cu(4)-C(6)	39.4(7)	37.4(5)

Таблиця А.4

Основні довжини зв'язків (d) та валентні кути (ω) в структурах π -комплексів

$[\text{Cu}^{\text{I}}\text{X}_2\{\text{C}_3\text{H}_5\text{-SC}(\text{-NH}_2)_2\}]$ X = Cl (**15**) та X = Br (**16**).

Зв'язок	$d, \text{\AA}$		Кут	$\omega, ^\circ$	
	15	16		15	16
Cu-X(1)	2.320(1)	2.447(2)	X(1)-Cu-X(1)'	92.99(4)	96.99(8)
Cu-X(1)'	2.634(1)	2.748(3)	X(1)-Cu-X(2)	113.28(5)	111.98(9)
Cu-X(2)	2.281(1)	2.408(2)	X(1)'-Cu-X(2)	99.06(4)	99.61(8)
Cu-C(1)	2.107(4)	2.128(7)	X(1)-Cu- <i>m</i>	113.4(1)	114.2(2)
Cu-C(2)	2.078(4)	2.115(7)	X(1)'-Cu- <i>m</i>	104.4(1)	103.5(2)
Cu- <i>m</i>	1.979(4)	2.009(7)	X(2)-Cu- <i>m</i>	125.8(1)	124.6(2)
C(1)-C(2)	1.357(6)	1.363(9)	C(1)-Cu-C(2)	37.8(2)	37.5(3)

Таблиця А.5

Основні довжини зв'язків (d) та валентні кути (ω) в структурах деяких комплексів Cu(I)

(**18-22, 24-29**) з тіоамідними лігандами

Зв'язок	$d, \text{\AA}$	Кут	$\omega, ^\circ$
сполука 18 , $[\text{CuCl}(\text{NH}_2\text{CSNH}_2)_2]$			
Cu(1)-S(2)	2.254(5)	S(2)-Cu(1)-S(3)	113.2(2)
Cu(1)-S(3)	2.306(5)	S(2)-Cu(1)-S(4)	127.7(2)
Cu(1)-S(4)	2.244(5)	S(2)-Cu(1)-Cl(1)	93.8(2)
Cu(1)-Cl(1)	3.164(6)	S(3)-Cu(1)-S(4)	116.8(2)
Cu(2)-S(1)	2.229(5)	S(3)-Cu(1)-Cl(1)	104.0(2)
Cu(2)-S(2)	2.265(5)	S(4)-Cu(1)-Cl(1)	89.0(2)
Cu(2)-S(3)	2.309(5)	S(1)-Cu(2)-S(2)	118.3(2)
Cu(2)-Cl(2)	2.828(5)	S(1)-Cu(2)-S(3)	120.3(2)
C(1)-S(1)	1.64(2)	S(1)-Cu(2)-Cl(2)	107.2(2)
C(2)-S(2)	1.72(2)	S(2)-Cu(2)-S(3)	116.0(2)
C(3)-S(3)	1.74(2)	S(2)-Cu(2)-Cl(2)	98.4(2)
C(4)-S(4)	1.71(2)	S(3)-Cu(2)-Cl(2)	87.3(2)

Продовження табл. А.5

Зв'язок	$d, \text{Å}$	Кут	$\omega, ^\circ$
сполука 19 , $[\text{Cu}(\text{NH}_2\text{CSNH}_2)_3]\text{Cl}$			
Cu-S(1)	2.43(4)	S(1)-Cu-S(2)	111
Cu-S(2)	2.27(8)	S(1)-Cu-S(3)	100
Cu-S(3)	2.34(6)	S(1)-Cu-S(1)'	114
Cu-S(1)'	2.37(9)	S(2)-Cu-S(3)	116
C-S	1.71-1.74	S(2)-Cu-S(1)'	107
		S(3)-Cu-S(1)'	109
сполука 20 , $[\text{Cu}(\text{NH}_2\text{CSNH}_2)_3]o\text{-HOOC}_6\text{H}_4\text{COO}$			
Cu-S(1)	2.247(4)	S(1)-Cu-S(2)	119.8(1)
Cu-S(2)	2.230(4)	S(1)-Cu-S(3)	117.2(1)
Cu-S(3)	2.238(3)	S(2)-Cu-S(3)	123.0(1)
C-S	1.708(7)–1.721(6)		
сполука 21 , $[\text{Cu}(\text{C}_3\text{H}_5\text{-NHCSNH}_2)_3]\text{NO}_3$			
Cu-S	2.241(1)	SCuS'	118.79(4)
C-S	1.718(4)		
сполука 22 , $[\text{Cu}_2(\text{NH}_2\text{CSNH}_2)_6]\text{SO}_4\cdot\text{H}_2\text{O}$			
Cu(1)-S(6)	2.2882(7)	S(6)-Cu(1)-S(4)	122.34(3)
Cu(1)-S(4)	2.2925(7)	S(6)-Cu(1)-S(2)	99.03(2)
Cu(1)-S(2)	2.3542(6)	S(4)-Cu(1)-S(2)	120.02(3)
Cu(1)-S(1)	2.4409(6)	S(6)-Cu(1)-S(1)	103.12(2)
Cu(2)-S(5)	2.2924(7)	S(4)-Cu(1)-S(1)	101.74(2)
Cu(2)-S(2)	2.3414(7)	S(2)-Cu(1)-S(1)	109.25(2)
Cu(2)-S(1)	2.3674(6)	S(5)-Cu(2)-S(2)	111.98(2)
Cu(2)-S(3)	2.3853(6)	S(5)-Cu(2)-S(1)	114.10(2)
S(1)-C(1)	1.741(2)	S(2)-Cu(2)-S(1)	109.36(2)
S(2)-C(2)	1.734(2)	S(5)-Cu(2)-S(3)	113.14(2)
S(3)-C(3)	1.719(2)	S(2)-Cu(2)-S(3)	107.47(2)

Продовження табл. А.5

Зв'язок	$d, \text{Å}$	Кут	$\omega, ^\circ$
S(4)-C(4)	1.715(2)	S(1)-Cu(2)-S(3)	100.00(2)
S(5)-C(5)	1.716(2)	Cu(2)-S(1)-Cu(1)	142.98(2)
S(6)-C(6)	1.698(2)	Cu(2)-S(2)-Cu(1)	125.78(2)
сполука 24 , $[\text{Cu}_4\text{Cl}_4(\text{C}_3\text{H}_5\text{-NHCSNH}_2)_6]$			
Cu(1)-S(5)	2.258(3)	S(5)Cu(1)S(1)	111.3(1)
Cu(1)-S(1)	2.295(3)	S(5)Cu(1)S(3)	118.3(1)
Cu(1)-S(3)	2.308(3)	S(5)Cu(1)Cl(1)	105.8(1)
Cu(1)-Cl(1)	2.579(3)	S(1)Cu(1)S(3)	109.6(1)
C(1)-S(1)	1.70(1)	S(1)Cu(1)Cl(1)	105.9(1)
		S(3)Cu(1)Cl(1)	105.0(1)
Cu(2)-S(4)	2.280(3)	S(4)Cu(2)S(1)	98.9(1)
Cu(2)-S(1)	2.324(3)	S(4)Cu(2)S(2)	108.9(1)
Cu(2)-S(2)	2.337(3)	S(4)Cu(2)Cl(2)	115.7(1)
Cu(2)-Cl(2)	2.390(3)	S(1)Cu(2)S(2)	115.7(1)
C(2)-S(2)	1.72(1)	S(1)Cu(2)Cl(2)	110.7(1)
		S(2)Cu(2)Cl(2)	107.1(1)
Cu(3)-S(6)	2.294(3)	S(6)Cu(3)S(4)	121.5(1)
Cu(3)-S(4)	2.325(3)	S(6)Cu(3)S(3)	97.3(1)
Cu(3)-S(3)	2.330(3)	S(6)Cu(3)Cl(3)	111.3(1)
Cu(3)-Cl(3)	2.388(3)	S(4)Cu(3)S(3)	106.5(1)
C(3)-S(3)	1.71(1)	S(4)Cu(3)Cl(3)	106.0(1)
C(4)-S(4)	1.69(1)	S(3)Cu(3)Cl(3)	114.4(1)
Cu(4)-S(2)	2.288(3)	S(2)Cu(4)S(6)	108.5(1)
Cu(4)-S(6)	2.301(3)	S(2)Cu(4)S(5)	106.6(1)
Cu(4)-S(5)	2.322(3)	S(2)Cu(4)Cl(4)	112.1(1)
Cu(4)-Cl(4)	2.426(3)	S(6)Cu(4)S(5)	108.1(1)
C(5)-S(5)	1.71(1)	S(6)Cu(4)Cl(4)	112.8(1)
C(6)-S(6)	1.72(1)	S(5)Cu(4)Cl(4)	108.4(1)

Продовження табл. А.5

Зв'язок	$d, \text{Å}$	Кут	$\omega, ^\circ$
сполука 25 , $[\text{Cu}_2(\text{C}_3\text{H}_5\text{-NHCSNH-C}_3\text{H}_5)_6](\text{NO}_3)_2$			
Cu-S(1)	2.298(5)	S(1)CuS(2)	120.8(2)
Cu-S(2)	2.288(5)	S(1)CuS(3)	97.1(2)
Cu-S(3)	2.367(5)	S(1)CuS(3)'	111.5(2)
Cu-S(3)'	2.431(4)	S(2)CuS(3)	117.2(2)
S(1)-C(10)	1.71(1)	S(2)CuS(3)'	102.4(2)
S(2)-C(20)	1.74(2)	S(3)CuS(3)'	107.6(2)
S(3)-C(30)	1.77(1)		
сполука 26 , $[\text{Cu}_2(\text{C}_3\text{H}_5\text{-NHCSNH-C}_3\text{H}_5)_6]\text{SiF}_6$			
Cu(1)-S(1)'	2.302(5)	S(1)-Cu(1)-S(2)	96.6(2)
Cu(1)-S(2)	2.264(5)	S(1)-Cu(1)-S(3)	101.2(2)
Cu(1)-S(3)	2.297(5)	S(1)-Cu(1)-S(1)'	93.2(2)
Cu(1)-S(1)	2.664(5)	S(1)'-Cu(1)-S(3)	114.7(2)
		S(1)'-Cu(1)-S(2)	119.0(2)
		S(2)-Cu(1)-S(3)	121.9(2)
Cu(2)-S(4)	2.257(5)	S(5)'-Cu(2)-S(5)	98.7(2)
Cu(2)-S(5)	2.275(5)	S(5)'-Cu(2)-S(4)	97.0(2)
Cu(2)-S(6)	2.281(6)	S(5)'-Cu(2)-S(6)	97.1(2)
Cu(2)-S(5)'	2.733(6)	S(4)-Cu(2)-S(5)	117.3(2)
		S(4)-Cu(2)-S(6)	114.7(2)
C-S	1.67(2)-1.72(2)	S(5)-Cu(2)-S(6)	122.8(2)
сполука 27 , $[\text{Cu}(\text{C}_3\text{H}_5\text{-NHCSNH}_2)(\text{CH}_3\text{CN})]\text{NO}_3$			
Cu(1)-S(1)	2.265(2)	S(1)-Cu(1)-S(2)	103.5(1)
Cu(1)-S(2)	2.750(3)	S(1)-Cu(1)-N(5)	112.3(2)
Cu(1)-N(5)	1.944(7)	S(1)-Cu(1)- <i>m</i> (1)	115.0(3)
Cu(1)-C(1)	2.10(1)	S(2)-Cu(1)-N(5)	94.7(2)
Cu(1)-C(2)	2.083(8)	S(2)-Cu(1)- <i>m</i> (1)	97.0(3)
Cu(1)- <i>m</i> (1)	1.983(8)	N(5)-Cu(1)- <i>m</i> (1)	126.7(4)

Продовження табл. А.5

Зв'язок	$d, \text{Å}$	Кут	$\omega, ^\circ$
C(1)-C(2)	1.33(1)	C(1)-Cu(1)-C(2)	37.2(4)
C(4)-S(1)	1.723(8)		
Cu(2)-S(2)	2.257(3)	S(1)-Cu(2)-S(2)	102.6(1)
Cu(2)-S(1)	2.788(3)	S(1)-Cu(2)-N(6)	97.5(2)
Cu(2)-N(6)	1.949(8)	S(1)-Cu(2)- <i>m</i> (2)	93.8(3)
Cu(2)-C(5)	2.10(1)	S(2)-Cu(2)-N(6)	109.7(2)
Cu(2)-C(6)	2.081(8)	S(2)-Cu(2)- <i>m</i> (2)	115.9(3)
Cu(2)- <i>m</i> (2)	1.983(8)	N(6)-Cu(2)- <i>m</i> (2)	129.1(3)
C(5)-C(6)	1.34(1)	C(5)-Cu(2)-C(6)	37.2(8)
C(8)-S(2)	1.729(9)		
сполука 28 , $[\text{CuCl}(\text{CH}_3\text{O}-\text{CO}-\text{C}(\text{CH}_3)=\text{N}-\text{NHCSNH}_2)_2]$			
Cu-S	2.228(3)	S-Cu-Cl	120.34(9)
Cu-Cl	2.273(3)		
C-S	1.71(1)		
сполука 29 , $[\text{CuCl}(\text{PPh}_3)_2(\text{CH}_3\text{O}-\text{CO}-\text{C}(\text{CH}_3)=\text{N}-\text{NHCSNH}_2)] \cdot 0.5\text{Ph}-\text{CH}_3$			
Cu-S	2.357(2)	S-Cu-Cl	109.9(1)
Cu-Cl	2.374(3)	S-Cu-P(1)	110.1(1)
Cu-P(1)	2.304(2)	S-Cu-P(2)	103.5(1)
Cu-P(2)	2.291(3)	Cl-Cu-P(1)	107.0(1)
C-S	1.694(9)	Cl-Cu-P(2)	102.6(1)
		P(1)-Cu-P(2)	123.2(1)

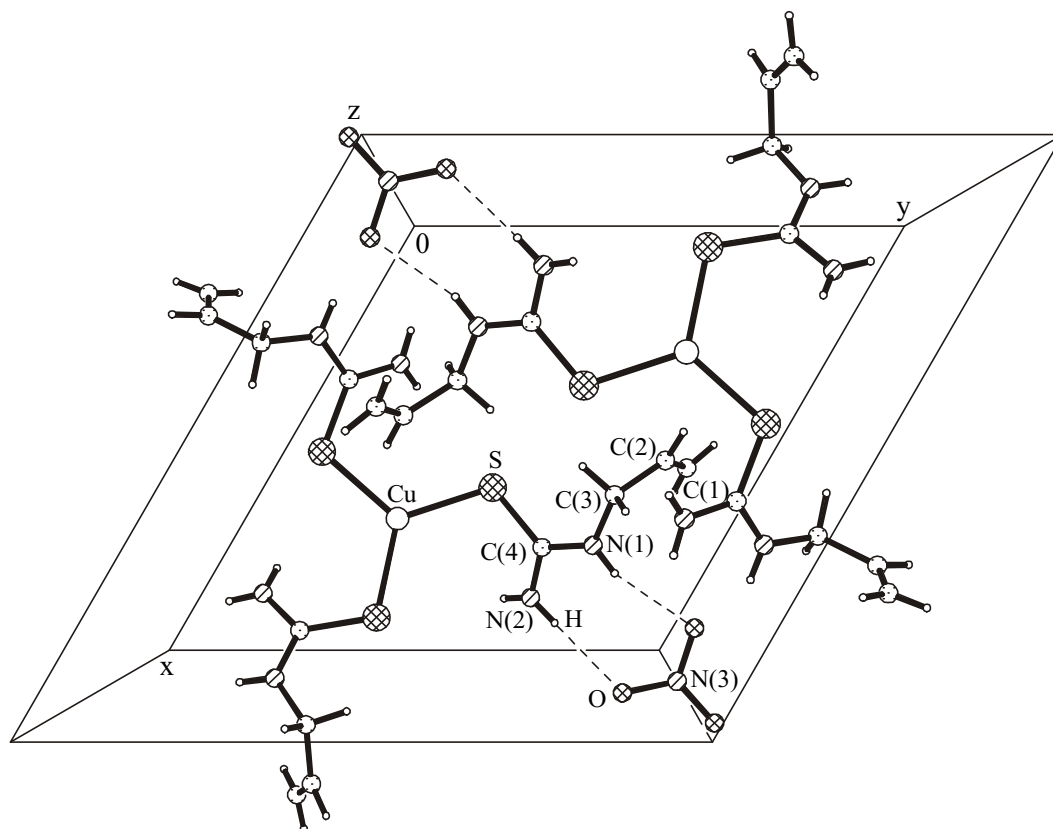


Рис. А.1. Фрагмент структури $[\text{Cu}(\text{C}_3\text{H}_5\text{-NHCSNH}_2)_3]\text{NO}_3$ (**21**).

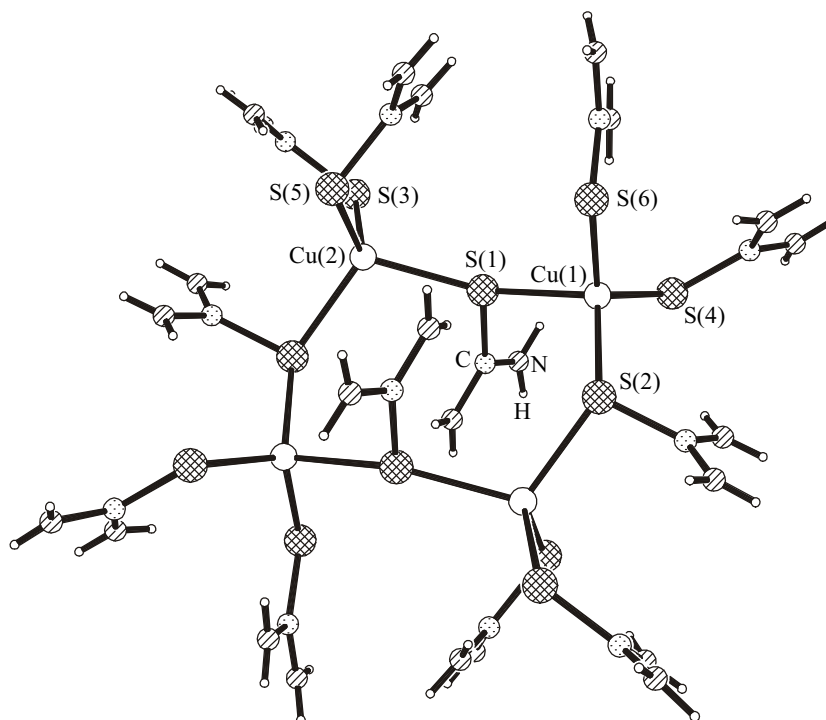


Рис. А.2. Катіон $[\text{Cu}_4(\text{NH}_2\text{CSNH}_2)_{12}]^{4+}$ в структурі **22**.

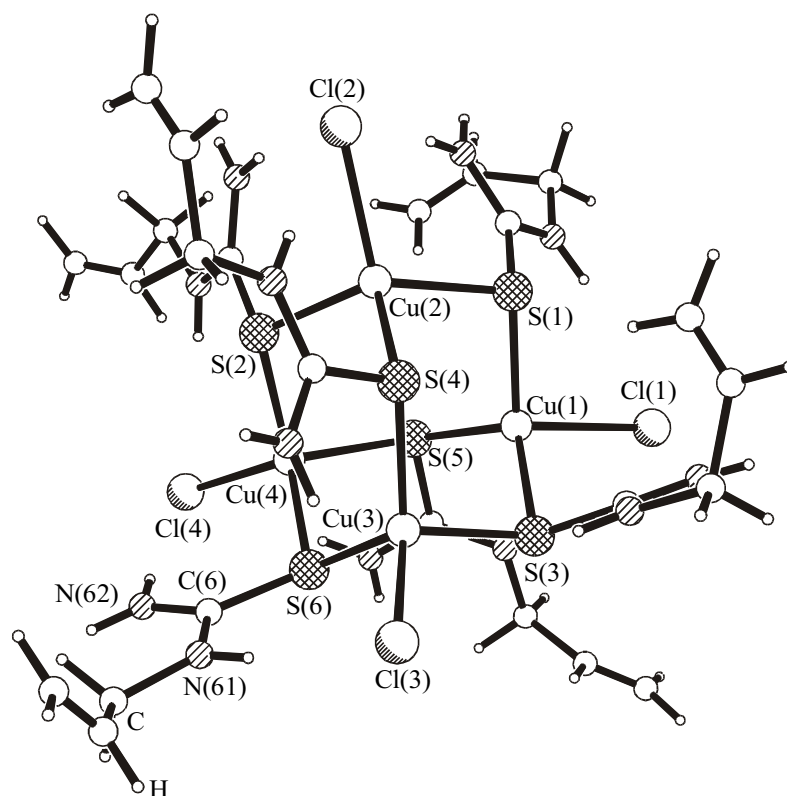


Рис. А.3. Тетраядерна асиметрична одиниця $[\text{Cu}_4\text{Cl}_4(\text{C}_3\text{H}_5\text{-NHCSNH}_2)_6]$ в структурі **23**.

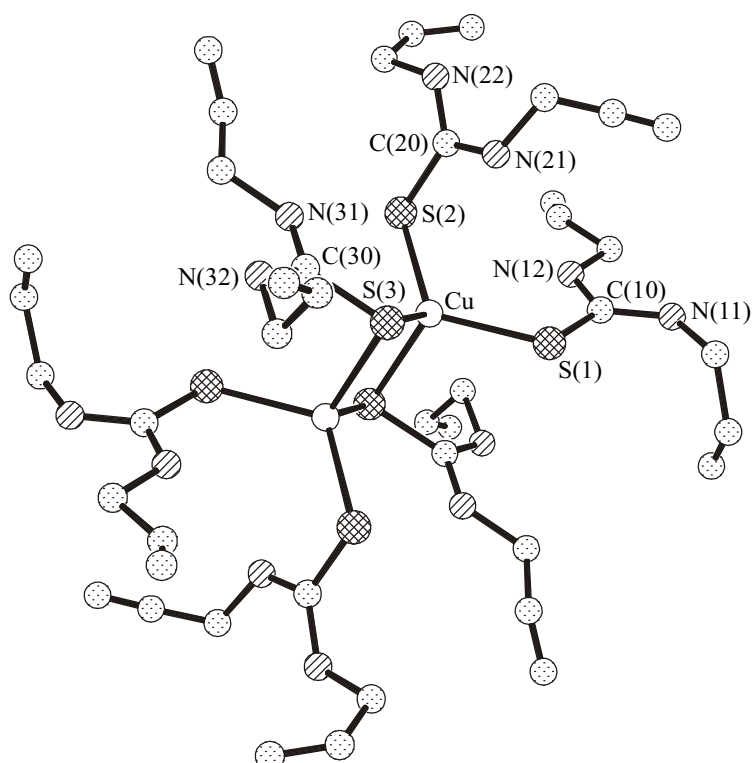


Рис. А.4. Катіон $[\text{Cu}_2(\text{C}_3\text{H}_5\text{-NHCSNH-C}_3\text{H}_5)]^{2+}$ в структурі **25**. Атоми Гідрогену не наведені.