Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 08:45 AM UTC

PDB ID	:	9GF9 / pdb_00009gf9
Title	:	S-Protease complexed with stapled peptide-like ligand
Authors	:	Perdriau, C.; Luton, A.; Zimmeter, K.; Neuville, M.; Saragaglia, C.; Pelusolltis, C.; Osz, J.; Kauffmann, B.; Collie, G.; Rochel, N.; Guichard, G.; Pasco, M.
Deposited on	:	2024-08-08
Resolution	:	1.76 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references ⓘ) were used in the production of this report:

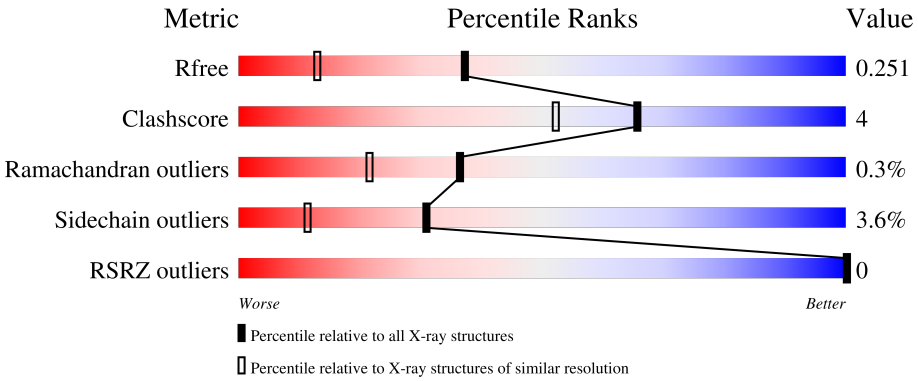
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.76 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



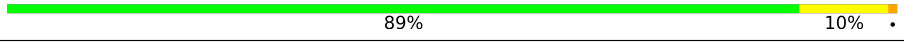
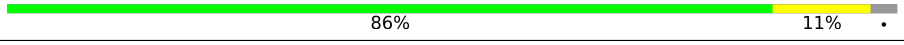
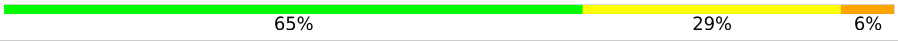
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	3183 (1.76-1.76)
Clashscore	190562	3299 (1.76-1.76)
Ramachandran outliers	187476	3274 (1.76-1.76)
Sidechain outliers	187428	3274 (1.76-1.76)
RSRZ outliers	180081	3183 (1.76-1.76)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	101	86% 14%
1	B	101	87% 12%
1	C	101	91% 9%
1	D	101	97%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	E	101	
1	F	101	
2	G	17	
2	H	17	
2	I	17	
2	J	17	
2	K	17	
2	L	17	

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 6090 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Ribonuclease pancreatic.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	101	Total	C	N	O	S	0	2	0
			802	487	146	158	11			
1	B	101	Total	C	N	O	S	0	3	0
			805	488	144	162	11			
1	C	101	Total	C	N	O	S	0	3	0
			794	480	141	162	11			
1	D	101	Total	C	N	O	S	0	2	0
			777	469	138	159	11			
1	E	101	Total	C	N	O	S	0	2	0
			784	477	139	157	11			
1	F	98	Total	C	N	O	S	0	1	0
			756	462	133	150	11			

- Molecule 2 is a protein called Ribonuclease pancreatic.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	G	17	Total	C	N	O	S	0	0	1
			125	76	23	25	1			
2	H	17	Total	C	N	O	S	0	0	1
			125	76	23	25	1			
2	I	17	Total	C	N	O	S	0	0	1
			125	76	23	25	1			
2	J	17	Total	C	N	O	S	0	0	1
			125	76	23	25	1			
2	K	17	Total	C	N	O	S	0	0	1
			125	76	23	25	1			
2	L	15	Total	C	N	O	S	0	0	1
			108	65	21	21	1			

There are 18 discrepancies between the modelled and reference sequences:

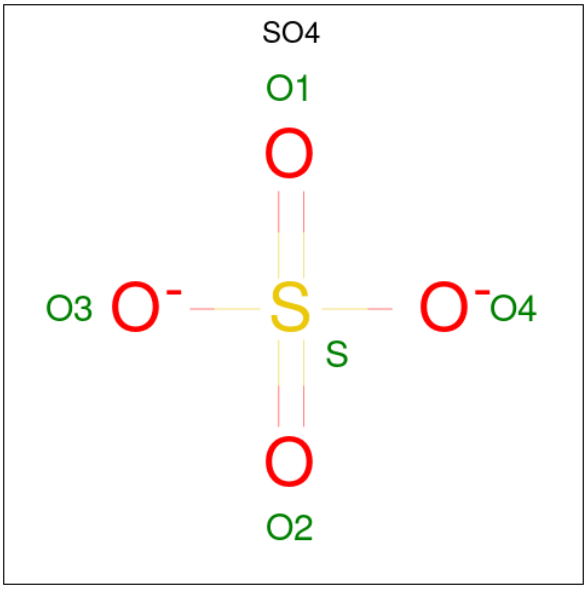
Chain	Residue	Modelled	Actual	Comment	Reference
G	1	ACE	-	acetylation	UNP P61823

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
G	8	NLE	LYS	engineered mutation	UNP P61823
G	17	NH2	-	amidation	UNP P61823
H	1	ACE	-	acetylation	UNP P61823
H	8	NLE	LYS	engineered mutation	UNP P61823
H	17	NH2	-	amidation	UNP P61823
I	1	ACE	-	acetylation	UNP P61823
I	8	NLE	LYS	engineered mutation	UNP P61823
I	17	NH2	-	amidation	UNP P61823
J	1	ACE	-	acetylation	UNP P61823
J	8	NLE	LYS	engineered mutation	UNP P61823
J	17	NH2	-	amidation	UNP P61823
K	1	ACE	-	acetylation	UNP P61823
K	8	NLE	LYS	engineered mutation	UNP P61823
K	17	NH2	-	amidation	UNP P61823
L	1	ACE	-	acetylation	UNP P61823
L	8	NLE	LYS	engineered mutation	UNP P61823
L	17	NH2	-	amidation	UNP P61823

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O_4S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total O S 5 4 1	0	0
3	A	1	Total O S 5 4 1	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total O S 5 4 1	0	0
3	A	1	Total O S 5 4 1	0	0
3	B	1	Total O S 5 4 1	0	0
3	B	1	Total O S 5 4 1	0	0
3	C	1	Total O S 5 4 1	0	0
3	C	1	Total O S 5 4 1	0	0
3	D	1	Total O S 5 4 1	0	0
3	D	1	Total O S 5 4 1	0	0
3	D	1	Total O S 5 4 1	0	0
3	E	1	Total O S 5 4 1	0	0
3	E	1	Total O S 5 4 1	0	0
3	E	1	Total O S 5 4 1	0	0
3	F	1	Total O S 5 4 1	0	0
3	G	1	Total O S 5 4 1	0	0
3	J	1	Total O S 5 4 1	0	0
3	L	1	Total O S 5 4 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	93	Total O 93 93	0	0
4	B	107	Total O 107 107	0	0
4	C	90	Total O 90 90	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	D	83	Total O 83 83	0	0
4	E	65	Total O 65 65	0	0
4	F	46	Total O 46 46	0	0
4	G	8	Total O 8 8	0	0
4	H	11	Total O 11 11	0	0
4	I	13	Total O 13 13	0	0
4	J	19	Total O 19 19	0	0
4	K	6	Total O 6 6	0	0
4	L	8	Total O 8 8	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Ribonuclease pancreatic

Chain A:





• Molecule 1: Ribonuclease pancreatic

Chain B:

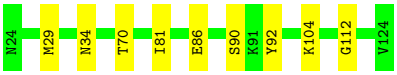




• Molecule 1: Ribonuclease pancreatic

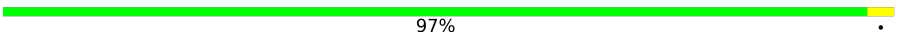
Chain C:





• Molecule 1: Ribonuclease pancreatic

Chain D:

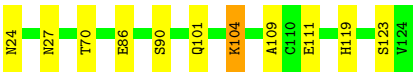




• Molecule 1: Ribonuclease pancreatic

Chain E:

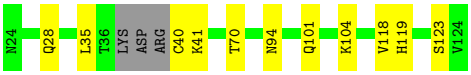




• Molecule 1: Ribonuclease pancreatic

Chain F:

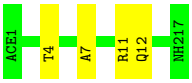




• Molecule 2: Ribonuclease pancreatic

Chain G:

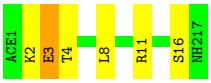




• Molecule 2: Ribonuclease pancreatic

Chain H:

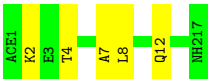




• Molecule 2: Ribonuclease pancreatic

Chain I:

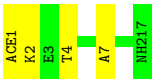




• Molecule 2: Ribonuclease pancreatic

Chain J:

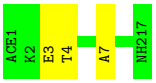




• Molecule 2: Ribonuclease pancreatic

Chain K:





• Molecule 2: Ribonuclease pancreatic

Chain L:





4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	44.23Å 44.36Å 93.69Å 88.19° 87.80° 67.11°	Depositor
Resolution (Å)	25.12 – 1.76 25.12 – 1.76	Depositor EDS
% Data completeness (in resolution range)	95.5 (25.12-1.76) 93.6 (25.12-1.76)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.56 (at 1.76Å)	Xtriage
Refinement program	BUSTER 2.10.4	Depositor
R, R_{free}	0.203 , 0.252 0.199 , 0.251	Depositor DCC
R_{free} test set	2951 reflections (4.76%)	wwPDB-VP
Wilson B-factor (Å^2)	19.2	Xtriage
Anisotropy	0.023	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.39 , 38.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.015 for -h,-k,l 0.016 for k,h,-l 0.298 for -k,-h,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	6090	wwPDB-VP
Average B, all atoms (Å^2)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.90% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ACE, HRG, NH2, NLE, SO4

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$\|Z\|$ >5	RMSZ	#$\|Z\|$ >5
1	A	0.87	1/816 (0.1%)	1.01	0/1102
1	B	0.79	0/819	0.99	0/1107
1	C	0.80	1/808 (0.1%)	0.98	1/1096 (0.1%)
1	D	0.85	0/791	0.99	0/1076
1	E	0.72	0/801	1.01	0/1085
1	F	0.75	0/772	1.04	0/1044
2	G	0.49	0/101	0.98	0/131
2	H	0.53	0/101	1.10	0/131
2	I	0.47	0/101	0.93	0/131
2	J	0.51	0/101	0.97	0/131
2	K	0.45	0/101	0.97	0/131
2	L	0.44	0/86	0.97	0/111
All	All	0.77	2/5398 (0.0%)	1.00	1/7276 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	G	1	0
2	H	1	0
2	I	1	0
2	J	1	0
2	K	1	0
2	L	1	0
All	All	6	0

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	29	MET	SD-CE	-5.83	1.65	1.79
1	A	29	MET	SD-CE	-5.47	1.65	1.79

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	112	GLY	N-CA-C	6.17	120.81	112.17

All (6) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	G	4	THR	CB
2	H	4	THR	CB
2	I	4	THR	CB
2	J	4	THR	CB
2	K	4	THR	CB
2	L	4	THR	CB

There are no planarity outliers.

5.2 Too-close contacts (i)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	802	0	762	7	0
1	B	805	0	757	11	0
1	C	794	0	726	5	0
1	D	777	0	699	1	0
1	E	784	0	731	6	0
1	F	756	0	714	4	0
2	G	125	0	114	3	0
2	H	125	0	113	4	0
2	I	125	0	114	2	0
2	J	125	0	114	6	0
2	K	125	0	114	1	0
2	L	108	0	92	0	0
3	A	20	0	0	1	0
3	B	10	0	0	1	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	10	0	0	0	0
3	D	15	0	0	0	0
3	E	15	0	0	0	0
3	F	5	0	0	0	0
3	G	5	0	0	0	0
3	J	5	0	0	0	0
3	L	5	0	0	0	0
4	A	93	0	0	1	0
4	B	107	0	0	2	0
4	C	90	0	0	0	0
4	D	83	0	0	0	0
4	E	65	0	0	0	0
4	F	46	0	0	0	0
4	G	8	0	0	0	0
4	H	11	0	0	1	0
4	I	13	0	0	0	0
4	J	19	0	0	0	0
4	K	6	0	0	0	0
4	L	8	0	0	0	0
All	All	6090	0	5050	40	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 4.

All (40) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:83:ASP:OD2	1:B:124:VAL:HG23	1.88	0.74
1:C:81:ILE:HD11	1:C:104:LYS:HE3	1.70	0.73
2:G:4:THR:HG23	2:G:7:ALA:H	1.52	0.73
2:H:2:LYS:HD3	2:H:11:HRG:HG1	1.72	0.72
2:J:4:THR:HG23	2:J:7:ALA:H	1.56	0.68
1:E:24:ASN:HD22	1:E:27:ASN:H	1.44	0.64
1:C:70:THR:O	1:C:70:THR:HG22	2.01	0.60
2:H:2:LYS:O	2:H:2:LYS:HG3	2.01	0.60
1:B:87:THR:HG22	1:B:98:LYS:HG2	1.86	0.58
2:I:4:THR:HG23	2:I:7:ALA:H	1.68	0.58
1:A:105:HIS:HE1	3:A:202:SO4:O3	1.87	0.56
2:H:8:NLE:HE3	4:H:101:HOH:O	2.06	0.56
1:B:50:SER:H	2:J:2:LYS:HZ3	1.55	0.55
1:D:92:TYR:OH	1:F:101:GLN:NE2	2.40	0.55

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:35:LEU:HD21	2:G:12:GLN:HG3	1.90	0.52
1:E:86:GLU:HG2	1:E:90:SER:HB3	1.92	0.52
2:K:4:THR:HG23	2:K:7:ALA:H	1.74	0.51
1:B:37:LYS:HD3	4:B:373:HOH:O	2.11	0.51
1:B:50:SER:H	2:J:2:LYS:NZ	2.08	0.50
1:A:34[B]:ASN:HD22	2:G:11:HRG:HD1	1.76	0.50
1:F:104:LYS:HE3	1:F:123:SER:OG	2.12	0.49
2:I:8:NLE:HE3	2:I:12:GLN:OE1	2.13	0.49
1:F:35:LEU:HD22	1:F:41:LYS:HD2	1.95	0.48
1:B:49:GLU:HA	2:J:2:LYS:HD2	1.96	0.48
4:B:392:HOH:O	2:J:4:THR:HG21	2.14	0.47
1:F:118:VAL:HG23	1:F:119:HIS:CD2	2.51	0.46
1:A:66:LYS:HZ3	1:B:85:ARG:HH22	1.63	0.45
1:A:124:VAL:HA	1:B:104:LYS:HE2	1.98	0.44
1:B:25:TYR:CE1	1:B:29:MET:HG3	2.53	0.43
1:E:104:LYS:HE2	1:E:123:SER:OG	2.18	0.43
1:E:109:ALA:HB3	1:E:119:HIS:HB2	2.01	0.43
1:C:70:THR:O	1:C:70:THR:CG2	2.67	0.42
1:E:70:THR:HG22	1:E:70:THR:O	2.19	0.42
1:C:86:GLU:HG2	1:C:90:SER:HB3	2.00	0.42
1:C:92:TYR:OH	1:E:101:GLN:NE2	2.52	0.42
1:B:91:LYS:HA	1:B:91:LYS:HD2	1.85	0.42
1:B:105:HIS:HE1	3:B:201:SO4:O1	2.02	0.41
2:J:1:ACE:O	2:J:2:LYS:HB3	2.21	0.40
1:A:98:LYS:HB2	4:A:349:HOH:O	2.21	0.40
2:H:2:LYS:H	2:H:8:NLE:HD3	1.87	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	101/101 (100%)	100 (99%)	1 (1%)	0	100 100
1	B	102/101 (101%)	101 (99%)	1 (1%)	0	100 100
1	C	102/101 (101%)	100 (98%)	2 (2%)	0	100 100
1	D	101/101 (100%)	98 (97%)	3 (3%)	0	100 100
1	E	101/101 (100%)	98 (97%)	3 (3%)	0	100 100
1	F	95/101 (94%)	91 (96%)	4 (4%)	0	100 100
2	G	13/17 (76%)	11 (85%)	2 (15%)	0	100 100
2	H	13/17 (76%)	10 (77%)	2 (15%)	1 (8%)	1 0
2	I	13/17 (76%)	11 (85%)	1 (8%)	1 (8%)	1 0
2	J	13/17 (76%)	11 (85%)	2 (15%)	0	100 100
2	K	13/17 (76%)	12 (92%)	1 (8%)	0	100 100
2	L	11/17 (65%)	10 (91%)	1 (9%)	0	100 100
All	All	678/708 (96%)	653 (96%)	23 (3%)	2 (0%)	36 21

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	I	2	LYS
2	H	3	GLU

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	93/91 (102%)	86 (92%)	7 (8%)	12 2
1	B	94/91 (103%)	91 (97%)	3 (3%)	34 14
1	C	91/91 (100%)	90 (99%)	1 (1%)	65 52
1	D	88/91 (97%)	86 (98%)	2 (2%)	44 24
1	E	90/91 (99%)	88 (98%)	2 (2%)	45 26
1	F	88/91 (97%)	84 (96%)	4 (4%)	24 7

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
2	G	10/10 (100%)	10 (100%)	0	100 100
2	H	10/10 (100%)	7 (70%)	3 (30%)	0 0
2	I	10/10 (100%)	10 (100%)	0	100 100
2	J	10/10 (100%)	10 (100%)	0	100 100
2	K	10/10 (100%)	9 (90%)	1 (10%)	7 1
2	L	8/10 (80%)	8 (100%)	0	100 100
All	All	602/606 (99%)	579 (96%)	23 (4%)	31 10

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	31	LYS
1	A	37	LYS
1	A	39[A]	ARG
1	A	39[B]	ARG
1	A	43	VAL
1	A	91	LYS
1	A	103	ASN
1	B	34[A]	ASN
1	B	34[B]	ASN
1	B	37	LYS
1	C	34	ASN
1	D	24	ASN
1	D	31	LYS
1	E	104	LYS
1	E	111	GLU
1	F	28	GLN
1	F	40	CYS
1	F	70	THR
1	F	94	ASN
2	H	3	GLU
2	H	4	THR
2	H	16	SER
2	K	3	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	105	HIS

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	B	94	ASN
1	B	101	GLN
1	B	105	HIS
1	C	28	GLN
1	C	34	ASN
1	C	62	ASN
1	C	69	GLN
1	C	105	HIS
1	D	24	ASN
1	D	28	GLN
1	D	105	HIS
1	E	24	ASN
1	E	28	GLN
1	E	34	ASN
1	E	101	GLN
1	E	105	HIS
1	F	28	GLN
1	F	34	ASN
1	F	101	GLN
2	J	12	GLN

5.3.3 RNA

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains

12 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	HRG	J	11	2	10,11,12	0.50	0	6,12,14	0.35	0
2	HRG	G	11	2	10,11,12	0.50	0	6,12,14	0.88	0
2	NLE	G	8	2	6,7,8	0.51	0	2,7,9	0.12	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
2	NLE	L	8	2	6,7,8	0.54	0	2,7,9	0.08	0
2	HRG	L	11	2	10,11,12	0.61	0	6,12,14	0.60	0
2	NLE	K	8	2	6,7,8	0.55	0	2,7,9	0.10	0
2	HRG	I	11	2	10,11,12	0.49	0	6,12,14	0.94	0
2	NLE	I	8	2	6,7,8	0.50	0	2,7,9	0.16	0
2	HRG	H	11	2	10,11,12	0.56	0	6,12,14	0.70	0
2	NLE	H	8	2	6,7,8	0.50	0	2,7,9	0.16	0
2	HRG	K	11	2	10,11,12	0.57	0	6,12,14	0.60	0
2	NLE	J	8	2	6,7,8	0.50	0	2,7,9	0.08	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HRG	J	11	2	-	2/9/10/12	-
2	HRG	G	11	2	-	2/9/10/12	-
2	NLE	G	8	2	-	2/5/6/8	-
2	NLE	L	8	2	-	2/5/6/8	-
2	HRG	L	11	2	-	2/9/10/12	-
2	NLE	K	8	2	-	2/5/6/8	-
2	HRG	I	11	2	-	4/9/10/12	-
2	NLE	I	8	2	-	2/5/6/8	-
2	HRG	H	11	2	-	3/9/10/12	-
2	NLE	H	8	2	-	2/5/6/8	-
2	HRG	K	11	2	-	1/9/10/12	-
2	NLE	J	8	2	-	1/5/6/8	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (25) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	H	11	HRG	NH1-CZ-NE-CD
2	H	11	HRG	NH2-CZ-NE-CD
2	I	11	HRG	NH2-CZ-NE-CD

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
2	I	11	HRG	NE-CD-CG-CG'
2	G	11	HRG	NE-CD-CG-CG'
2	K	11	HRG	NE-CD-CG-CG'
2	H	8	NLE	CA-CB-CG-CD
2	L	8	NLE	CE-CD-CG-CB
2	K	8	NLE	CE-CD-CG-CB
2	G	8	NLE	CE-CD-CG-CB
2	H	11	HRG	CD-CG-CG'-CB
2	I	8	NLE	CE-CD-CG-CB
2	K	8	NLE	CA-CB-CG-CD
2	H	8	NLE	CE-CD-CG-CB
2	L	8	NLE	CA-CB-CG-CD
2	G	11	HRG	CD-CG-CG'-CB
2	I	11	HRG	N-CA-CB-CG'
2	L	11	HRG	N-CA-CB-CG'
2	I	8	NLE	CA-CB-CG-CD
2	I	11	HRG	NH1-CZ-NE-CD
2	J	11	HRG	NH1-CZ-NE-CD
2	G	8	NLE	CA-CB-CG-CD
2	J	8	NLE	CA-CB-CG-CD
2	L	11	HRG	NE-CD-CG-CG'
2	J	11	HRG	NH2-CZ-NE-CD

There are no ring outliers.

4 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	G	11	HRG	1	0
2	I	8	NLE	1	0
2	H	11	HRG	1	0
2	H	8	NLE	2	0

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

18 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul

statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	SO4	A	202	-	4,4,4	0.30	0	6,6,6	0.72	0
3	SO4	F	201	-	4,4,4	0.29	0	6,6,6	0.18	0
3	SO4	D	202	-	4,4,4	0.32	0	6,6,6	0.41	0
3	SO4	L	101	-	4,4,4	0.30	0	6,6,6	0.43	0
3	SO4	A	203	-	4,4,4	0.29	0	6,6,6	0.45	0
3	SO4	D	201	-	4,4,4	0.34	0	6,6,6	0.69	0
3	SO4	E	201	-	4,4,4	0.32	0	6,6,6	0.52	0
3	SO4	A	201	-	4,4,4	0.30	0	6,6,6	0.68	0
3	SO4	B	202	-	4,4,4	0.28	0	6,6,6	0.19	0
3	SO4	D	203	-	4,4,4	0.30	0	6,6,6	0.24	0
3	SO4	C	202	-	4,4,4	0.26	0	6,6,6	0.35	0
3	SO4	C	201	-	4,4,4	0.30	0	6,6,6	0.54	0
3	SO4	A	204	-	4,4,4	0.30	0	6,6,6	0.23	0
3	SO4	G	101	-	4,4,4	0.27	0	6,6,6	0.17	0
3	SO4	J	101	-	4,4,4	0.25	0	6,6,6	0.50	0
3	SO4	E	203	-	4,4,4	0.30	0	6,6,6	0.54	0
3	SO4	E	202	-	4,4,4	0.30	0	6,6,6	0.21	0
3	SO4	B	201	-	4,4,4	0.30	0	6,6,6	0.71	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

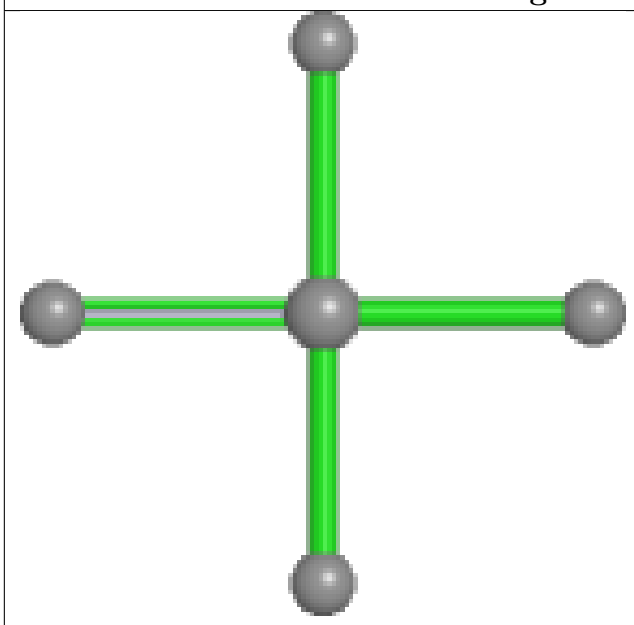
2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	202	SO4	1	0
3	B	201	SO4	1	0

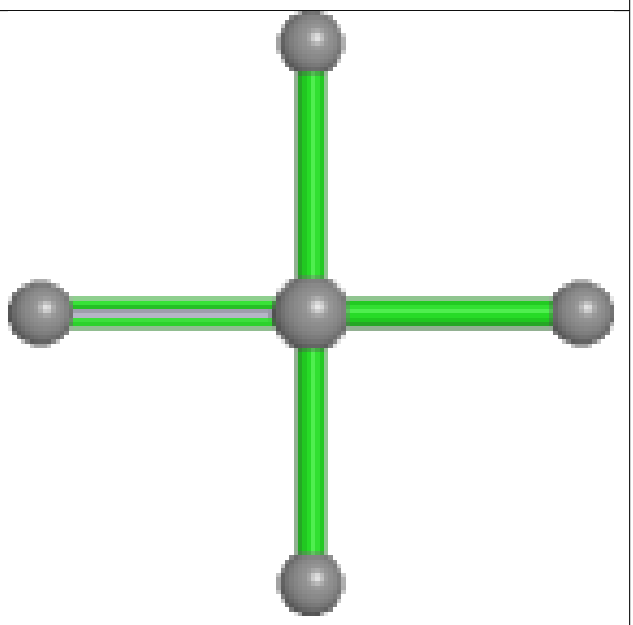
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is

within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

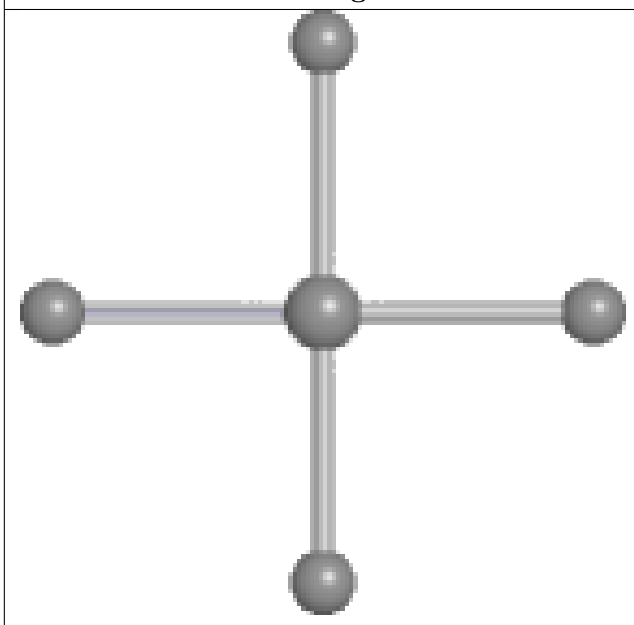
Ligand SO4 A 202



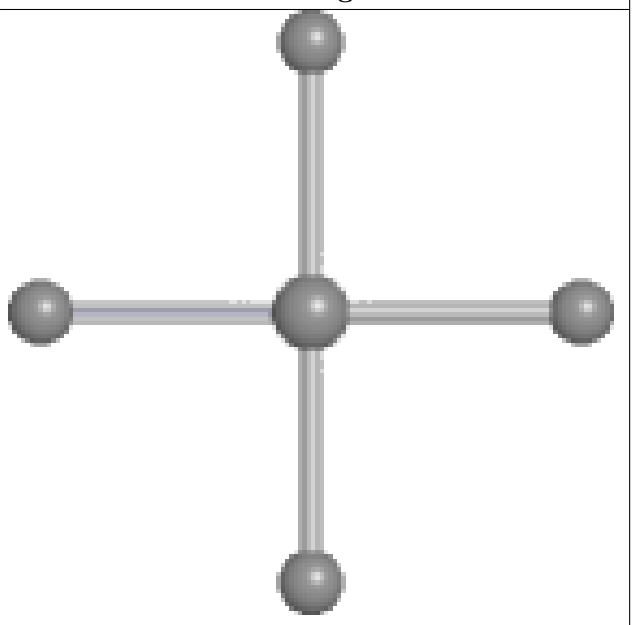
Bond lengths



Bond angles

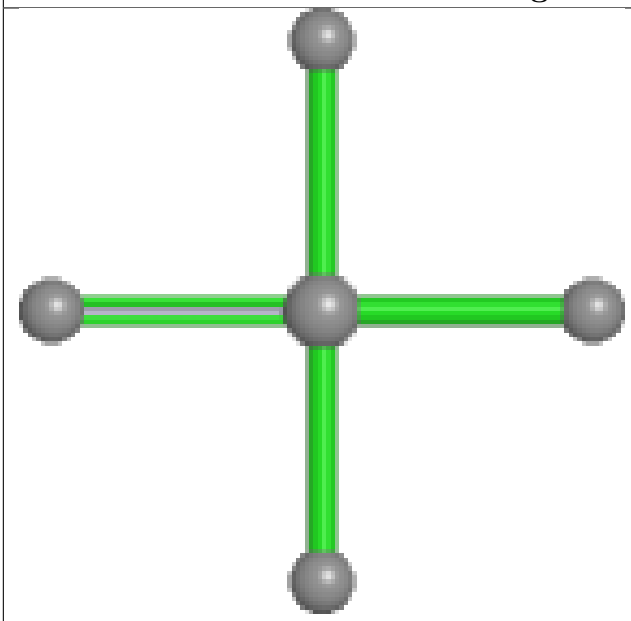


Torsions

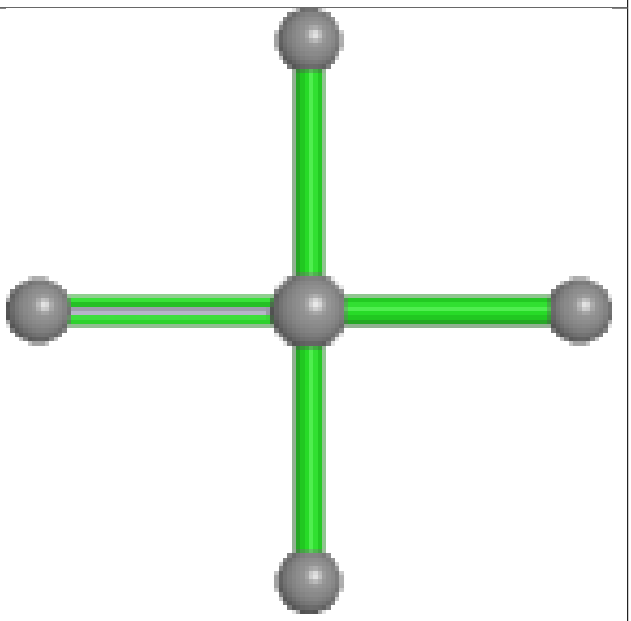


Rings

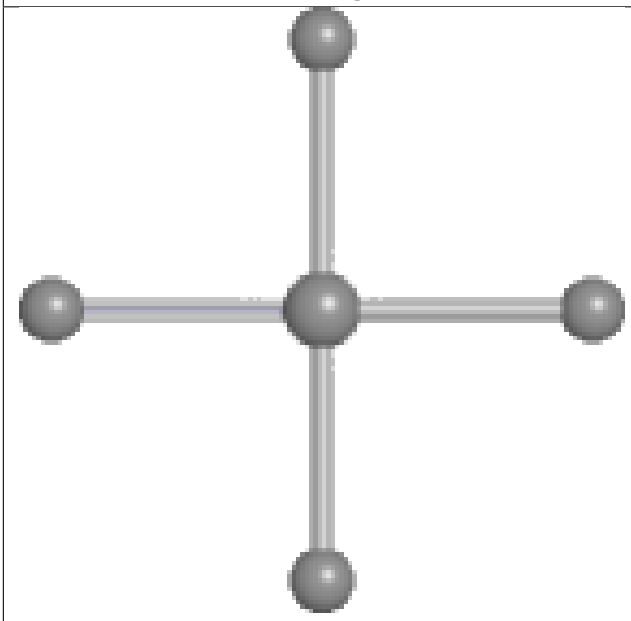
Ligand SO4 F 201



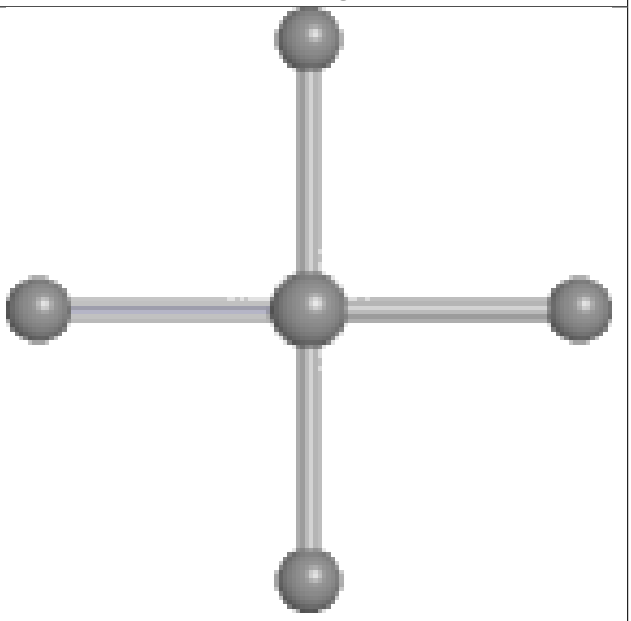
Bond lengths



Bond angles

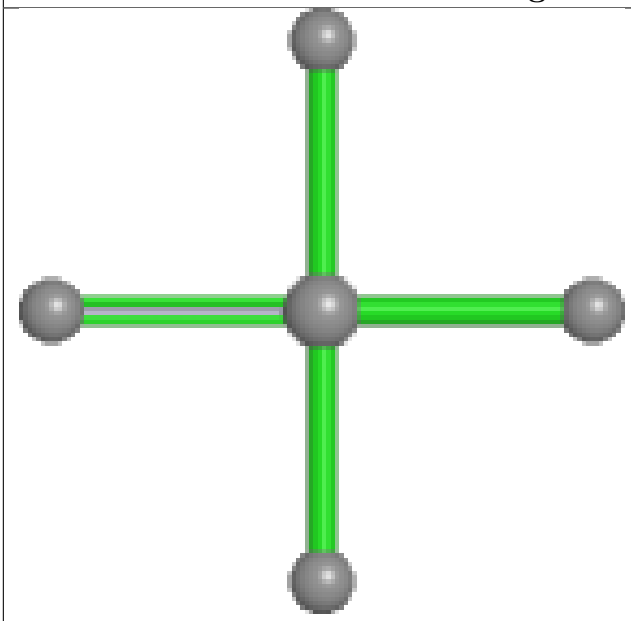


Torsions

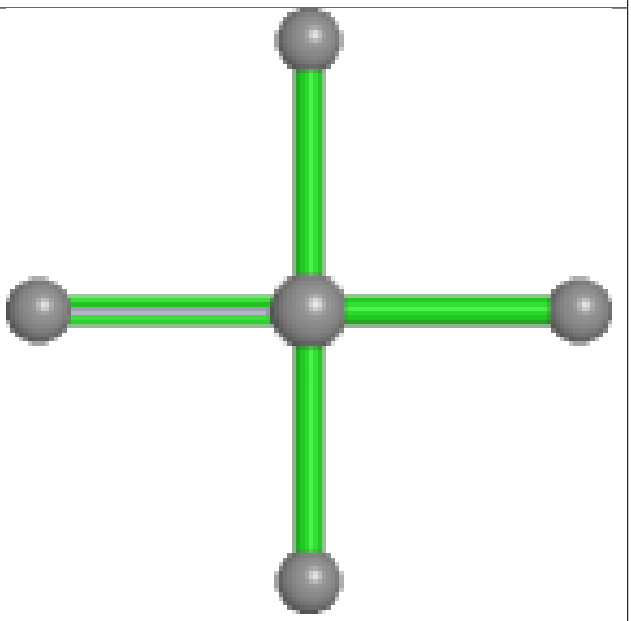


Rings

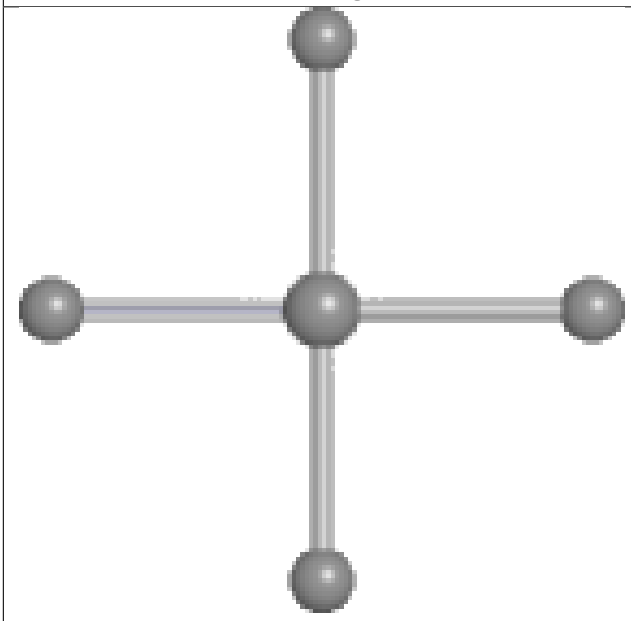
Ligand SO4 D 202



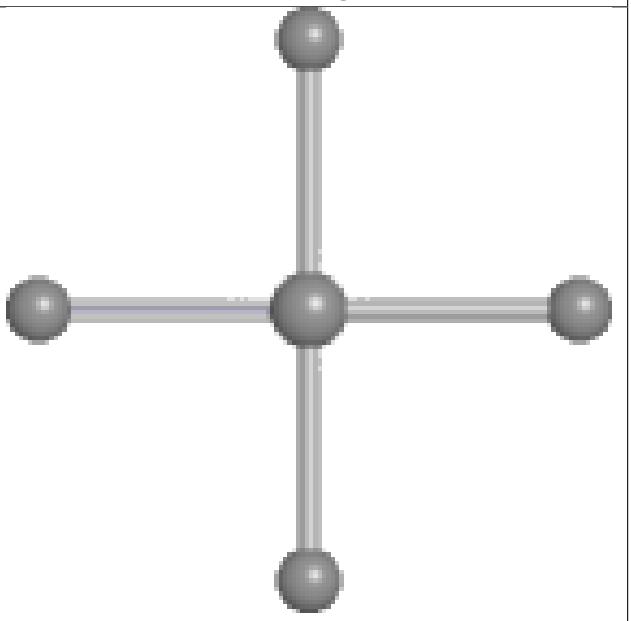
Bond lengths



Bond angles

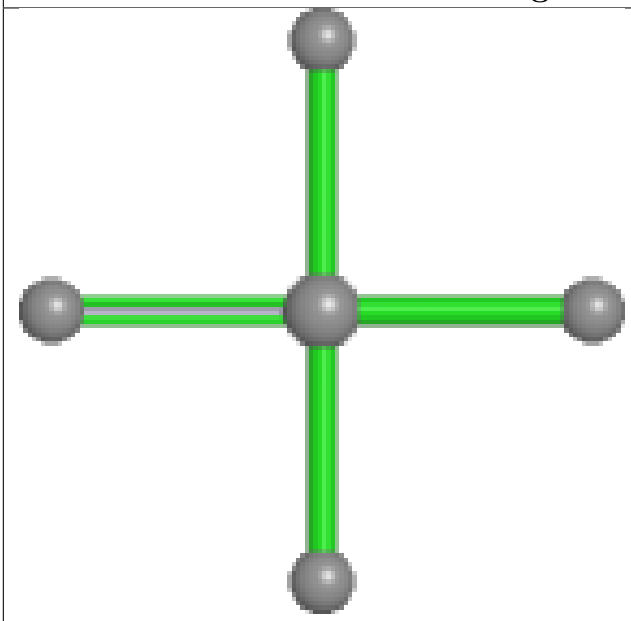


Torsions

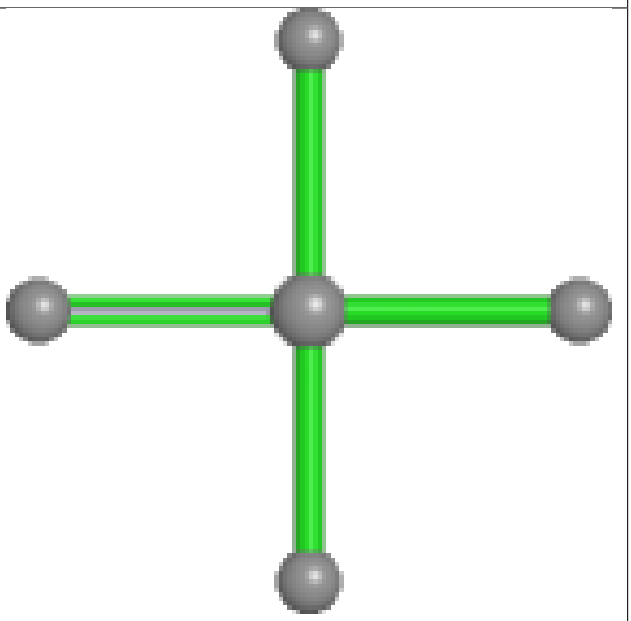


Rings

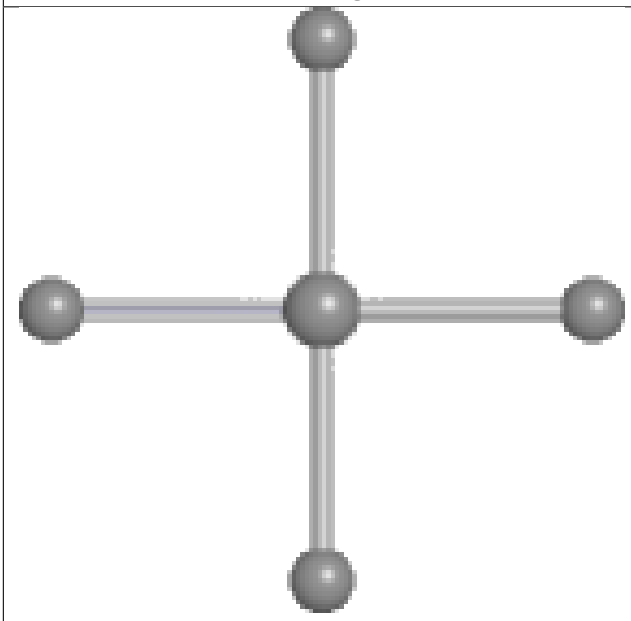
Ligand SO4 L 101



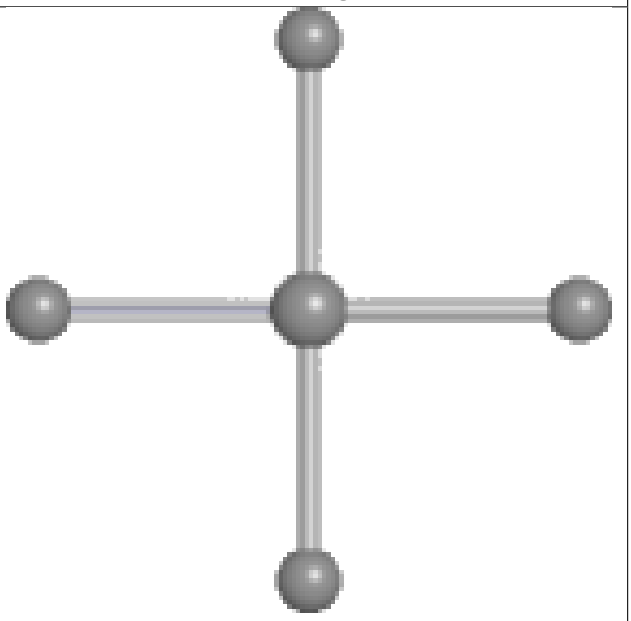
Bond lengths



Bond angles

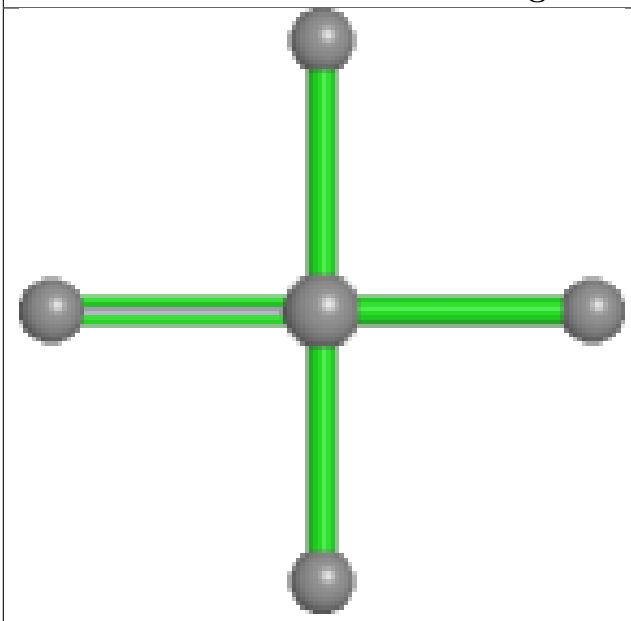


Torsions

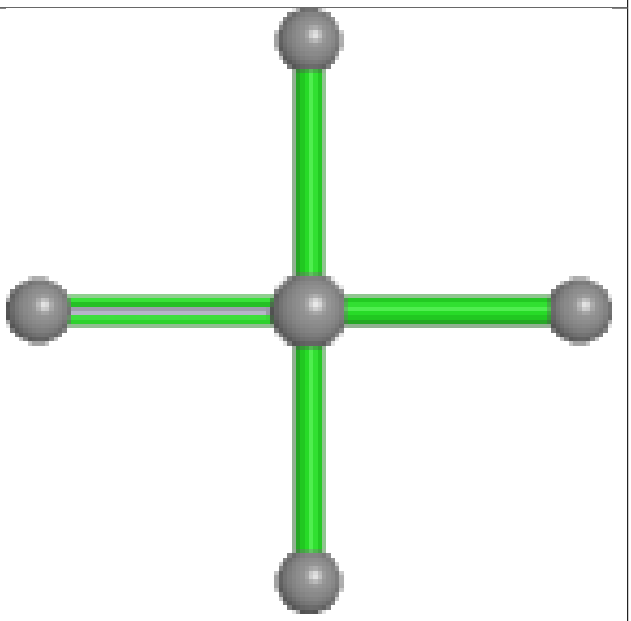


Rings

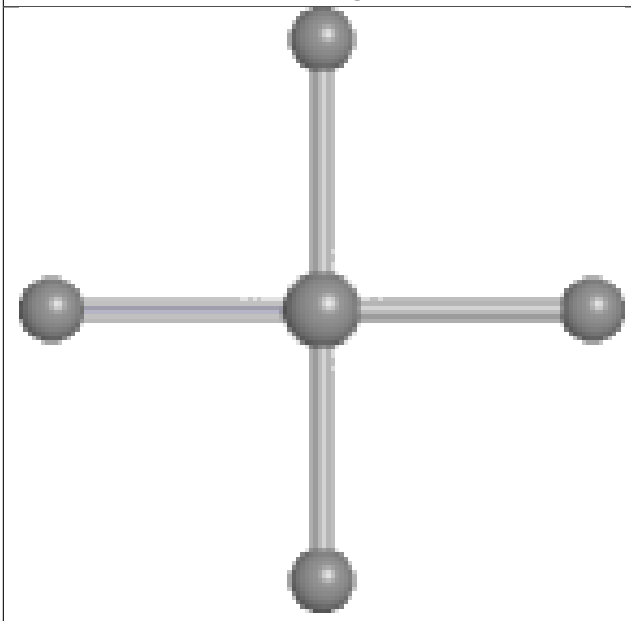
Ligand SO4 A 203



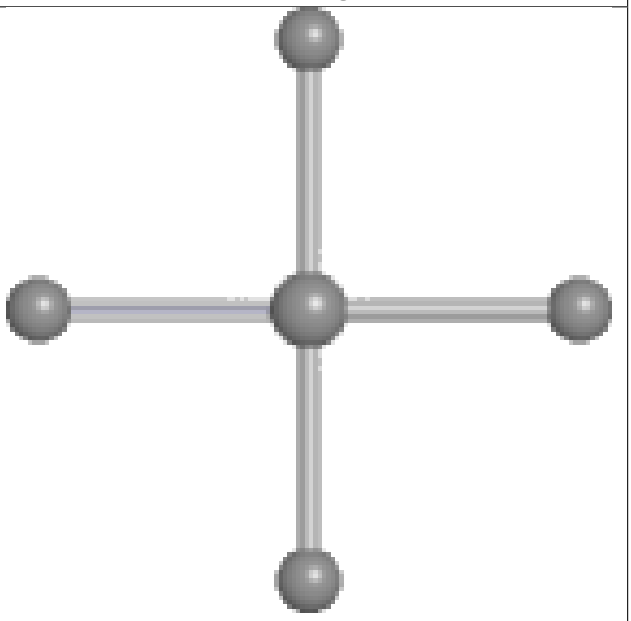
Bond lengths



Bond angles

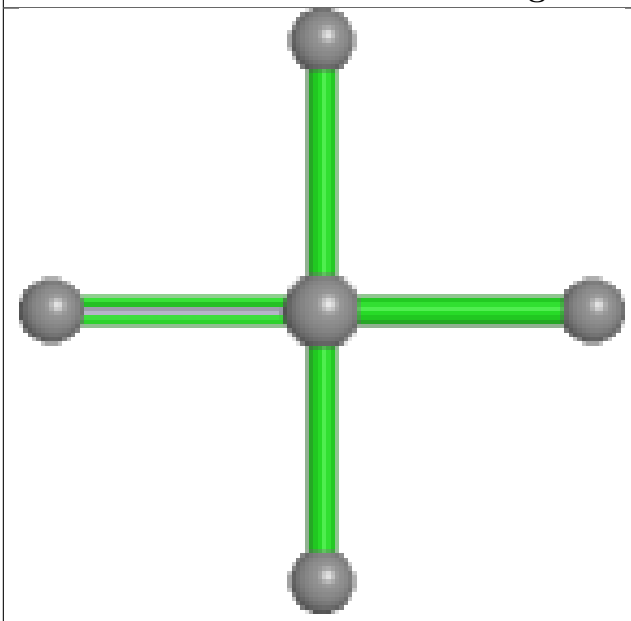


Torsions

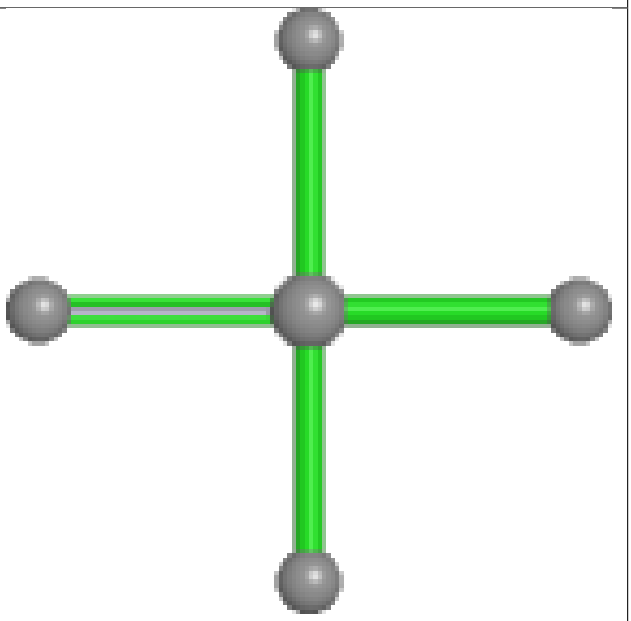


Rings

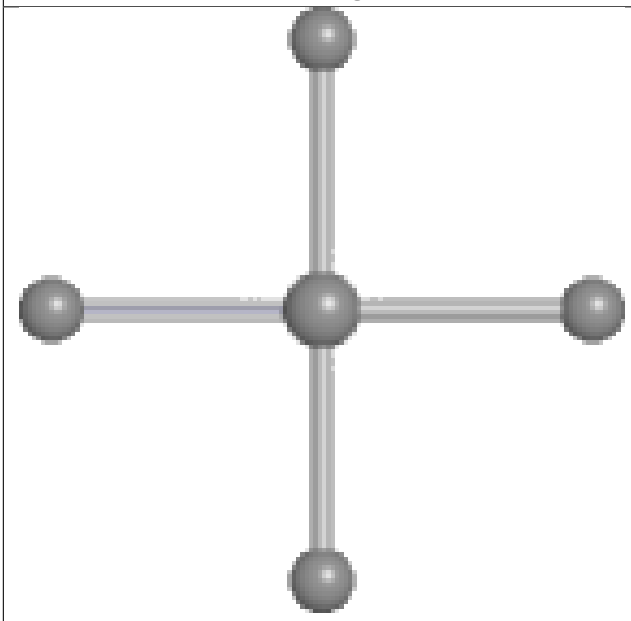
Ligand SO4 D 201



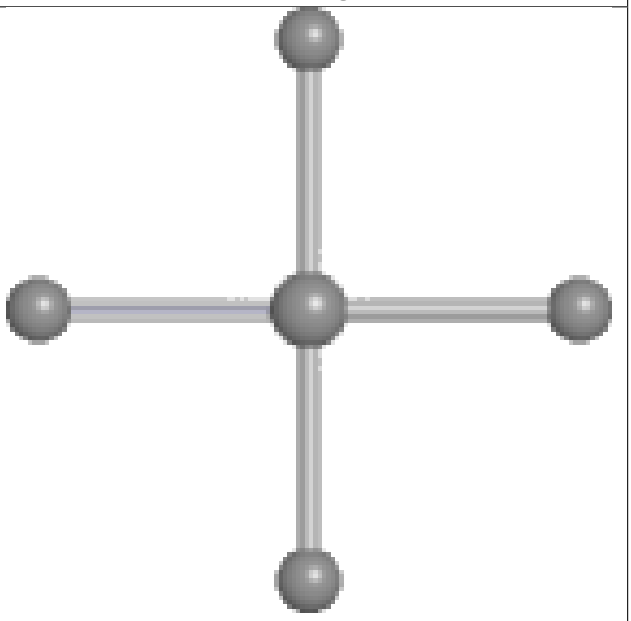
Bond lengths



Bond angles

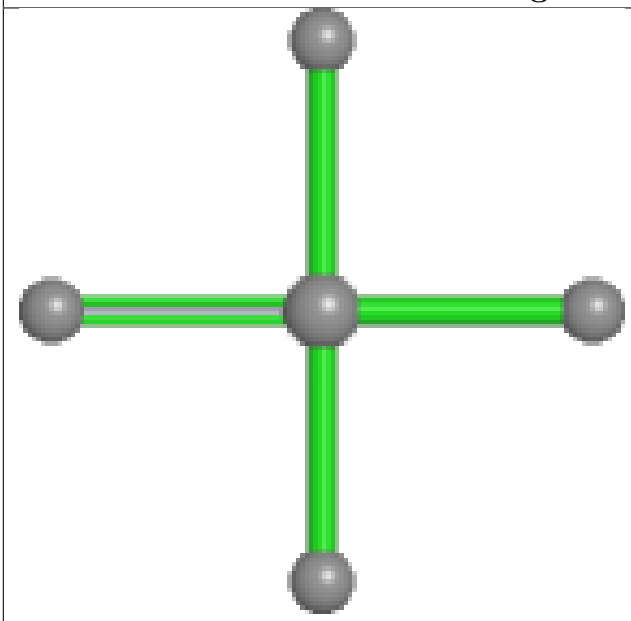


Torsions

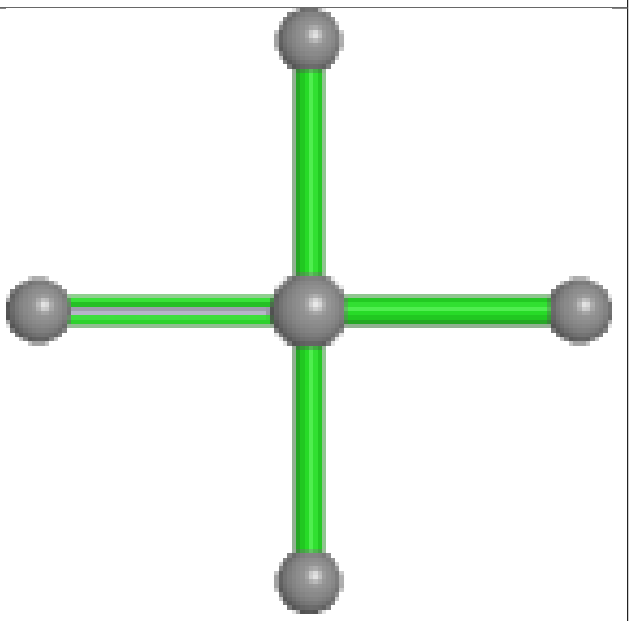


Rings

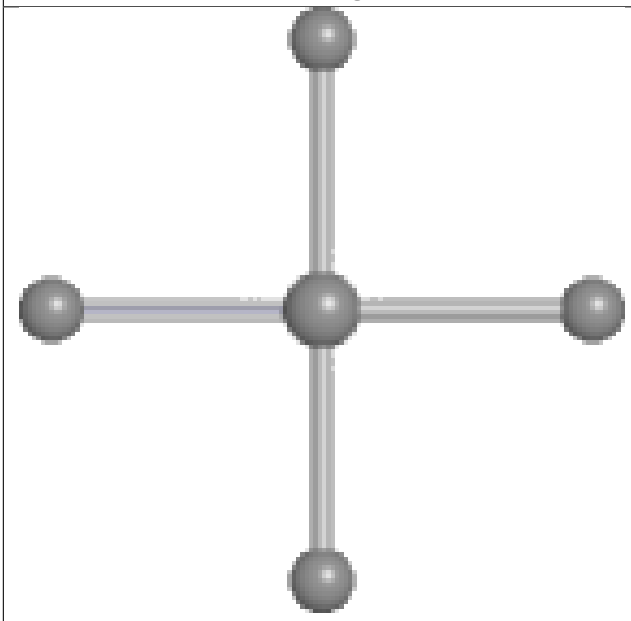
Ligand SO4 E 201



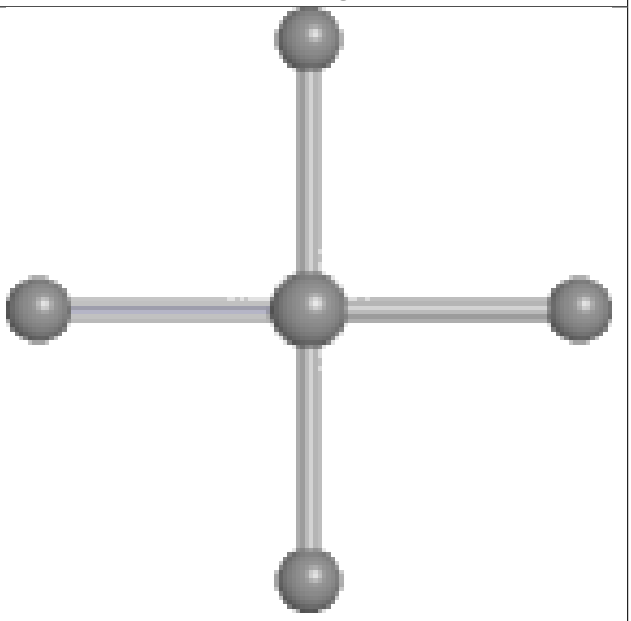
Bond lengths



Bond angles

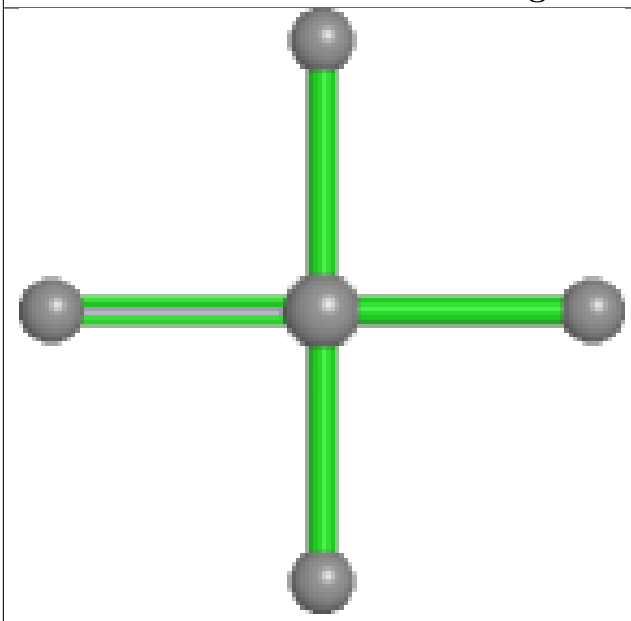


Torsions

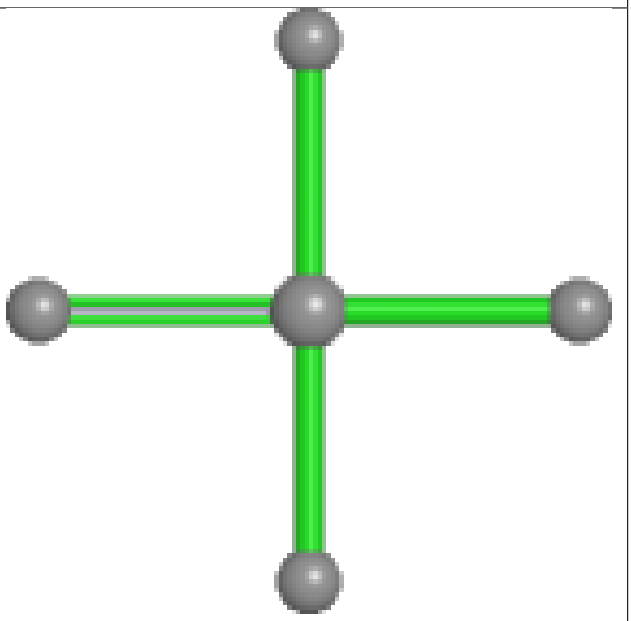


Rings

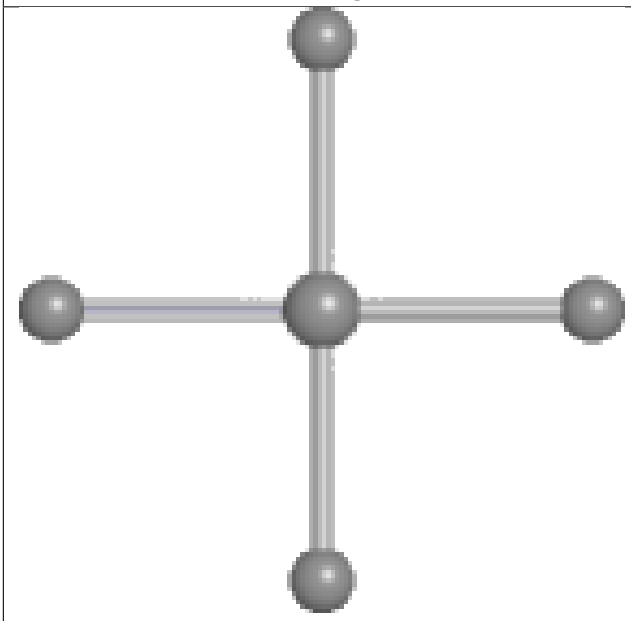
Ligand SO4 A 201



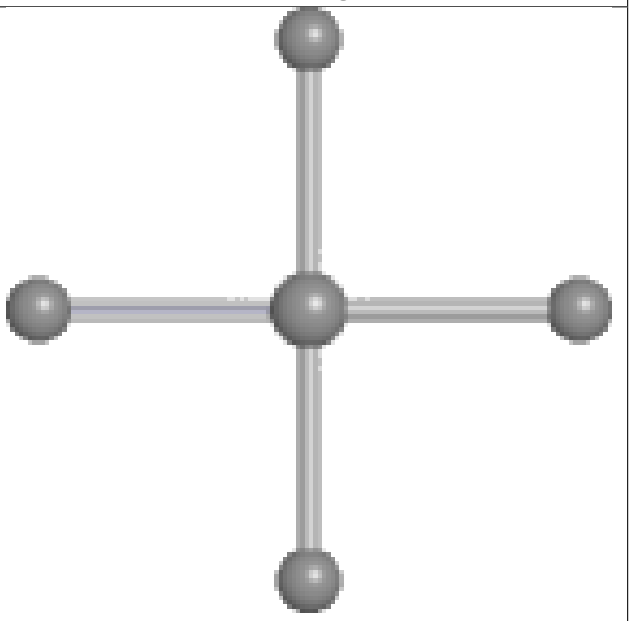
Bond lengths



Bond angles

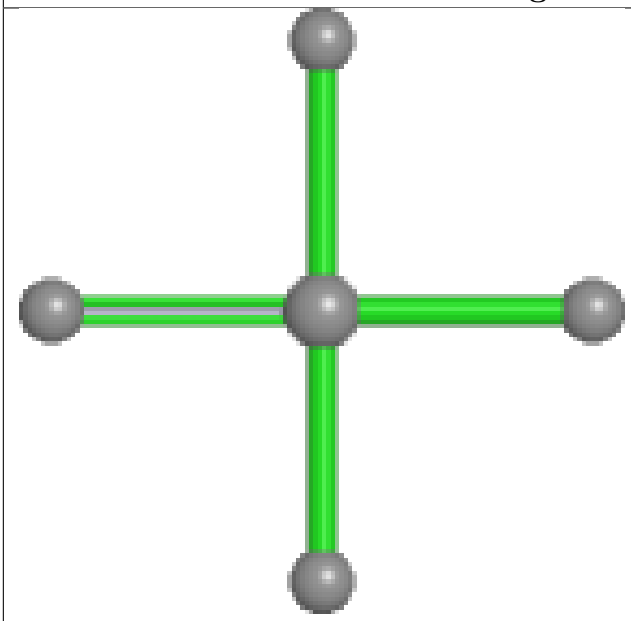


Torsions

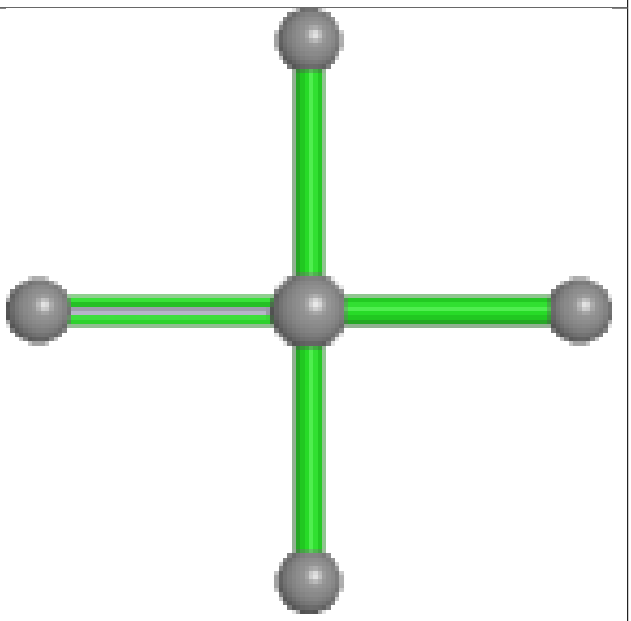


Rings

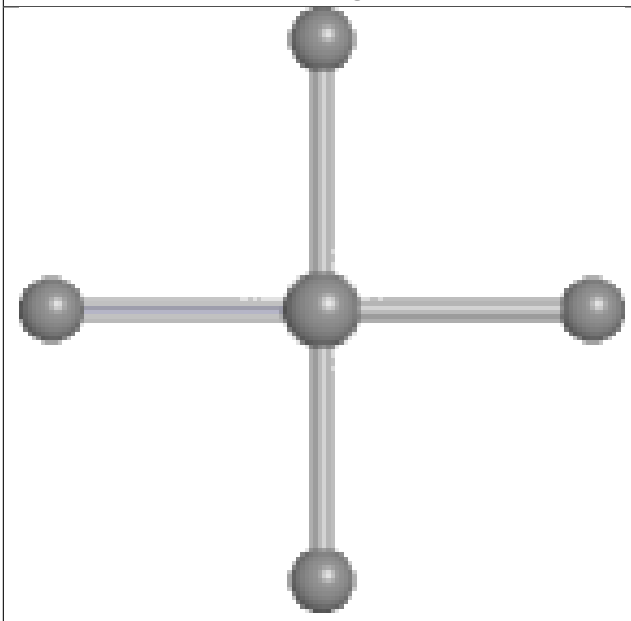
Ligand SO4 B 202



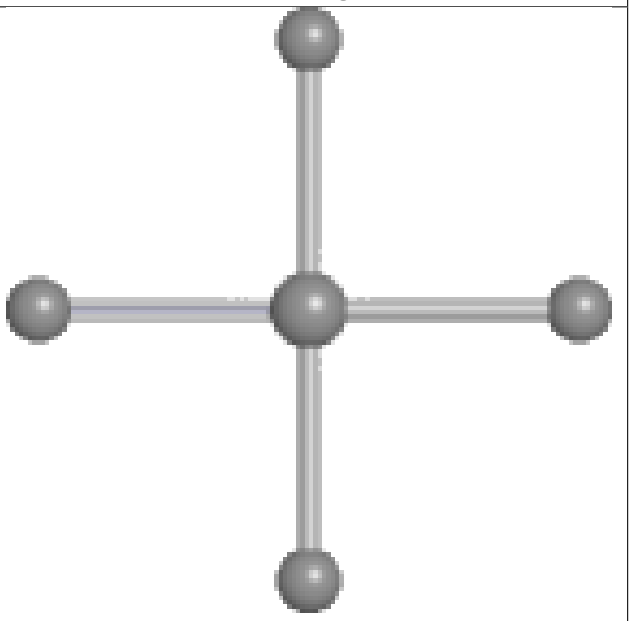
Bond lengths



Bond angles

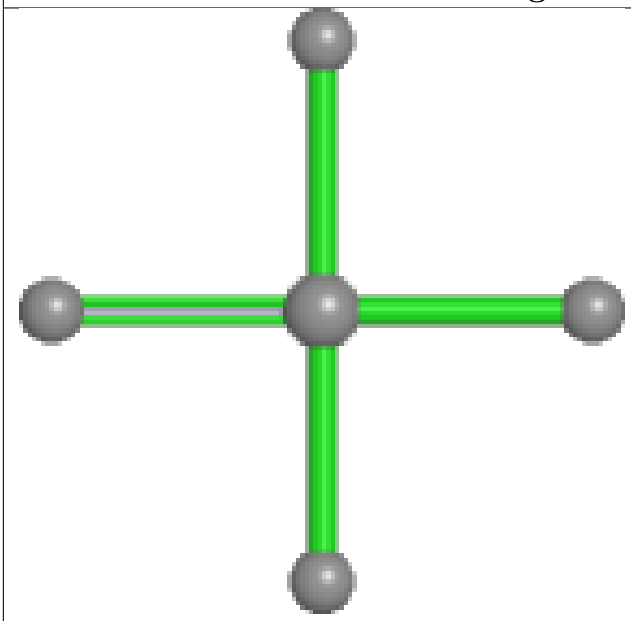


Torsions

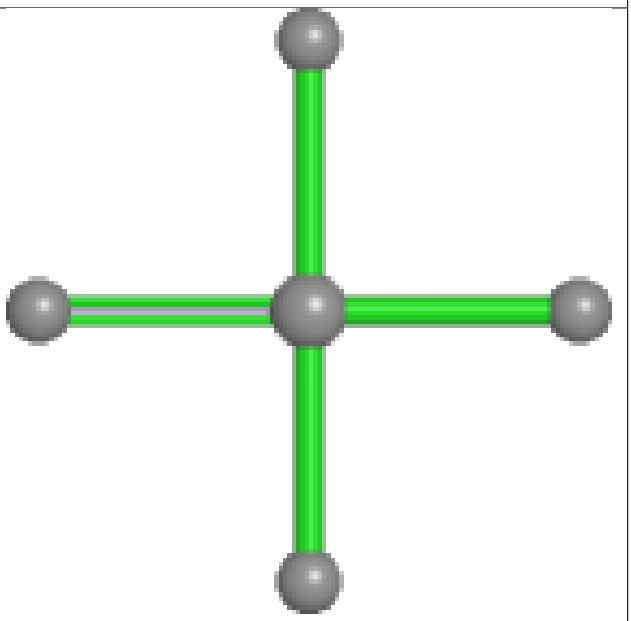


Rings

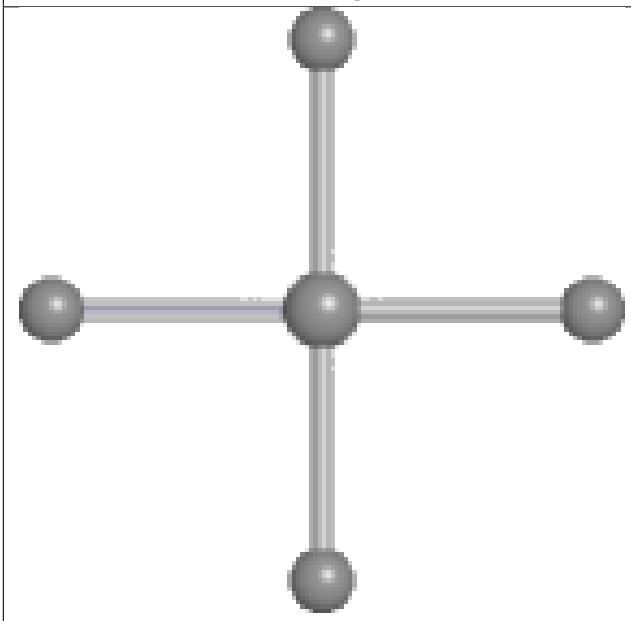
Ligand SO4 D 203



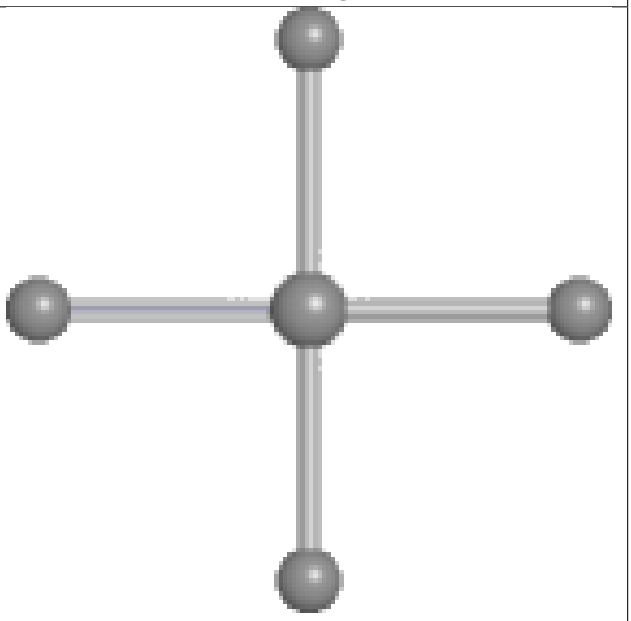
Bond lengths



Bond angles

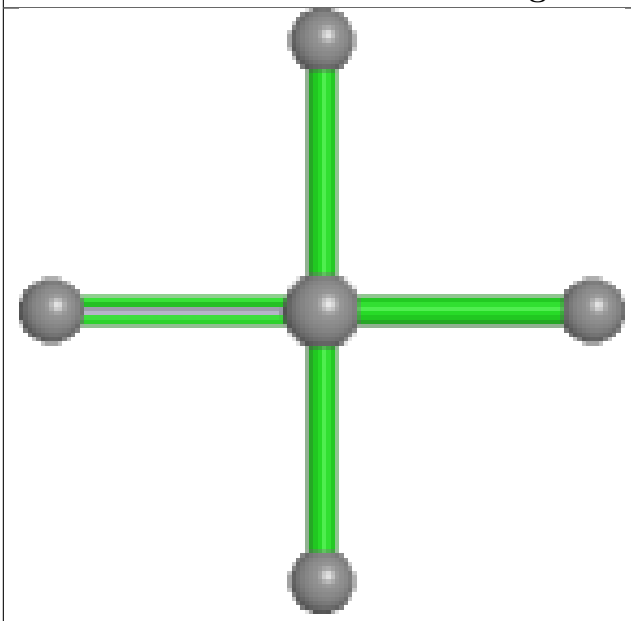


Torsions

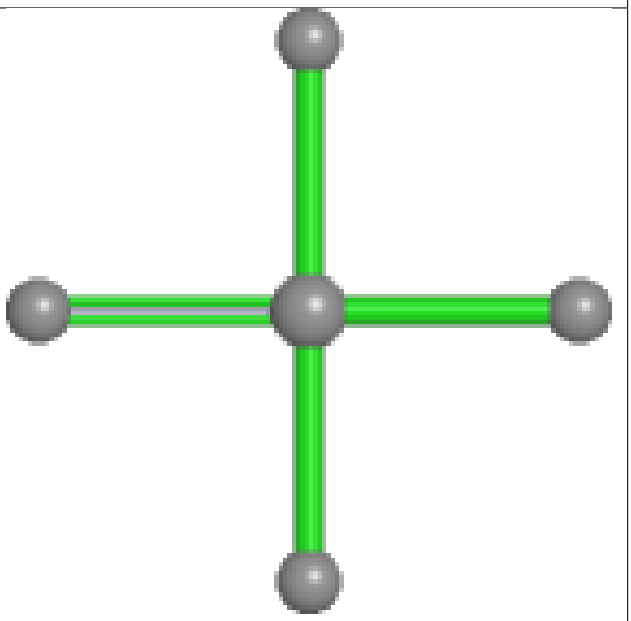


Rings

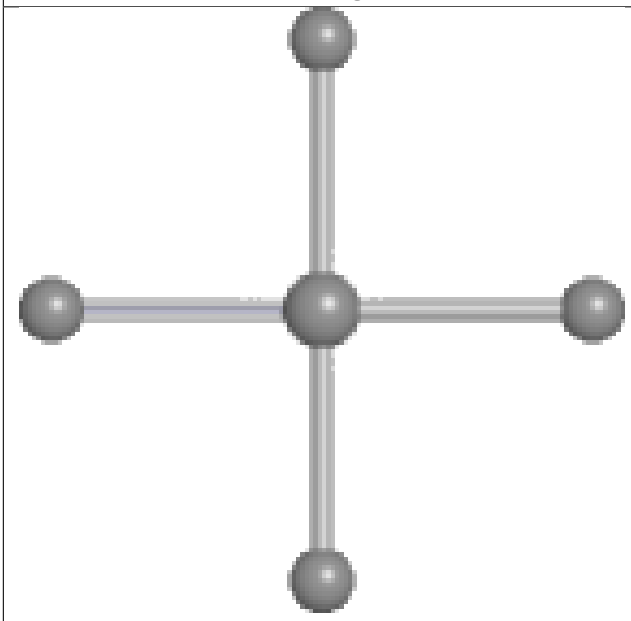
Ligand SO4 C 202



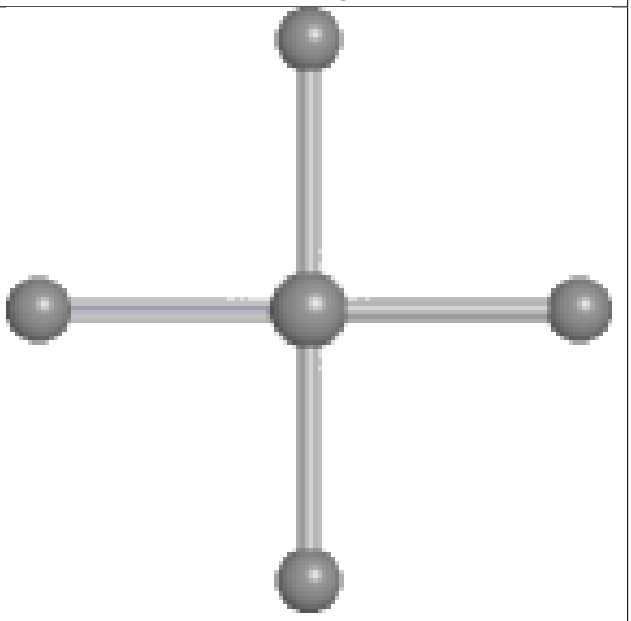
Bond lengths



Bond angles

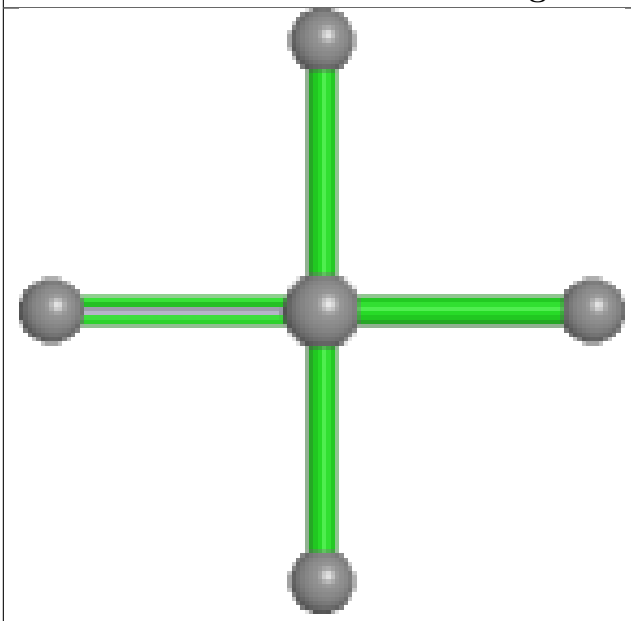


Torsions

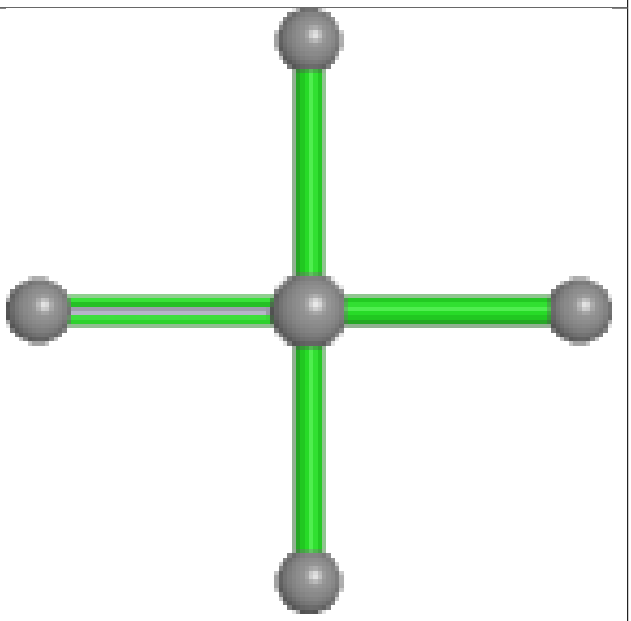


Rings

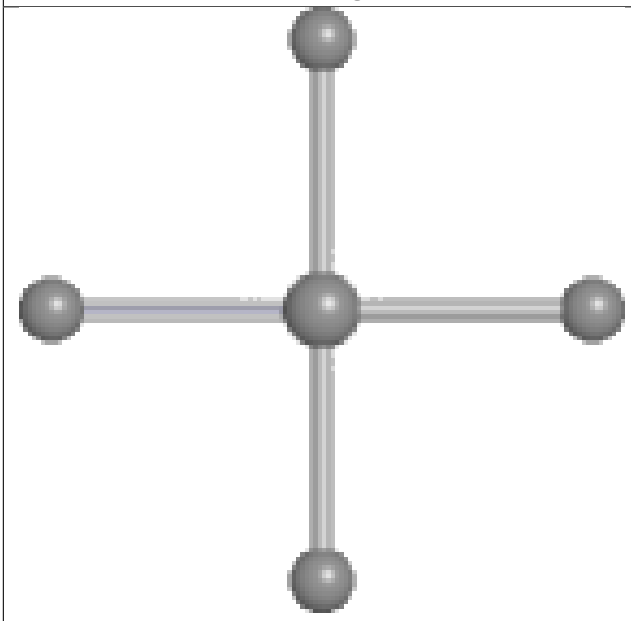
Ligand SO4 C 201



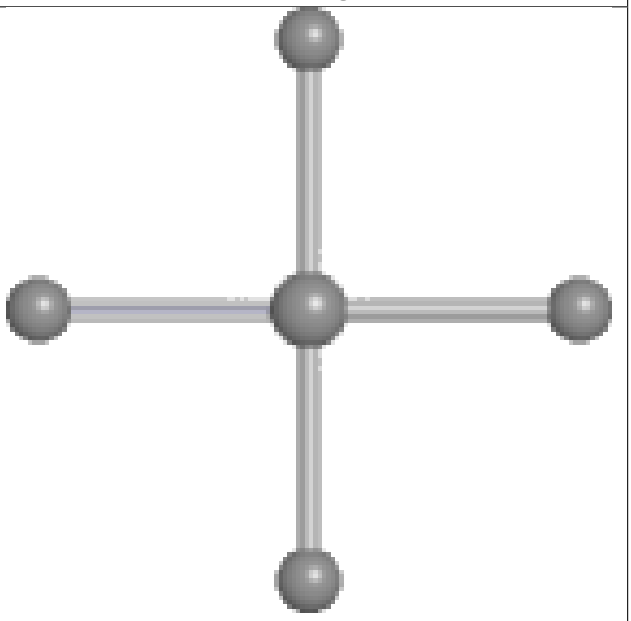
Bond lengths



Bond angles

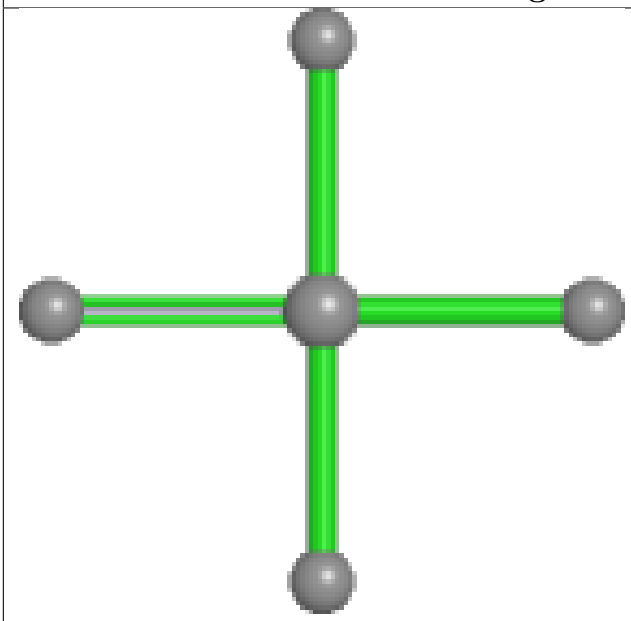


Torsions

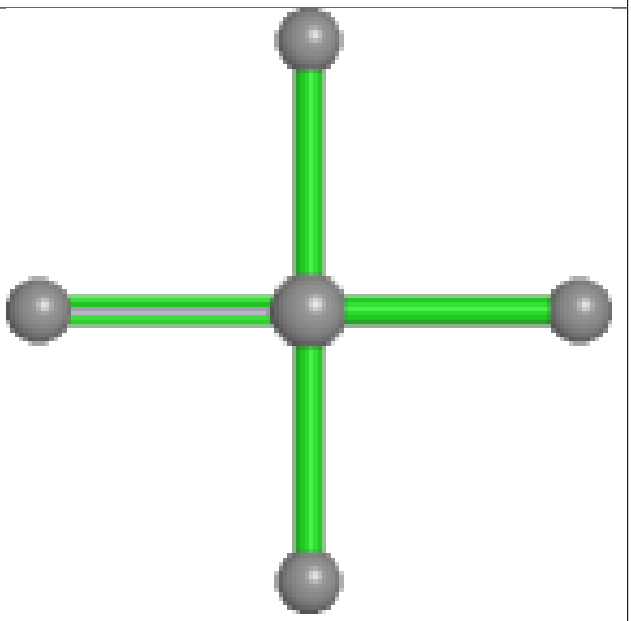


Rings

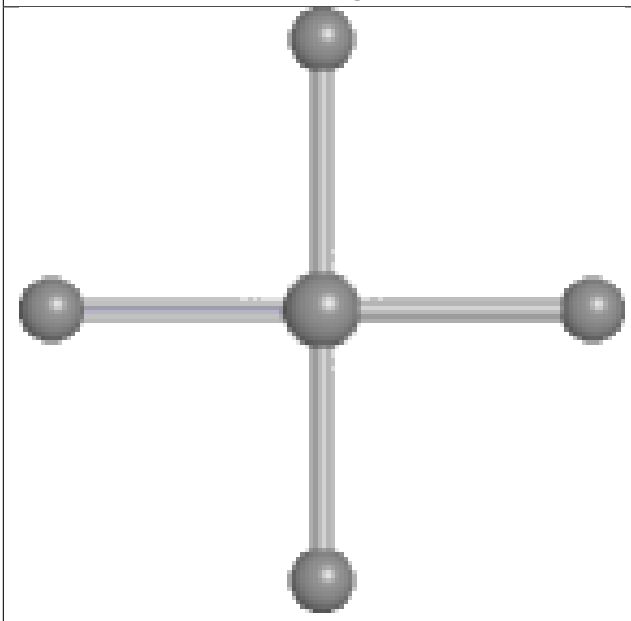
Ligand SO4 A 204



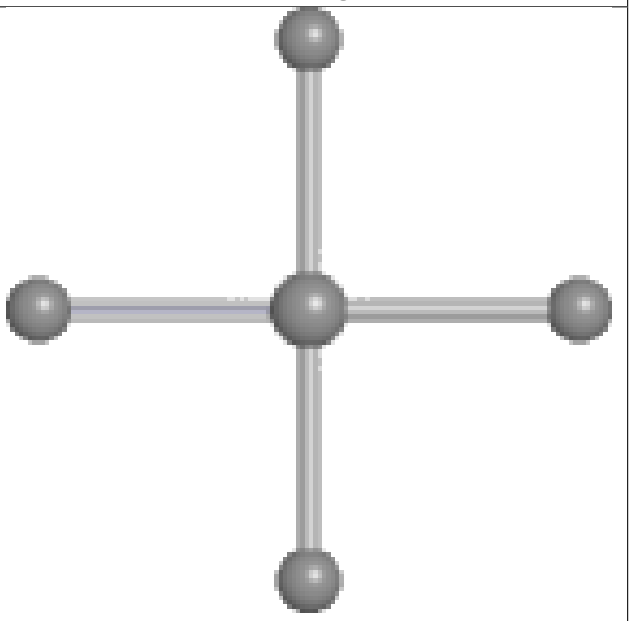
Bond lengths



Bond angles

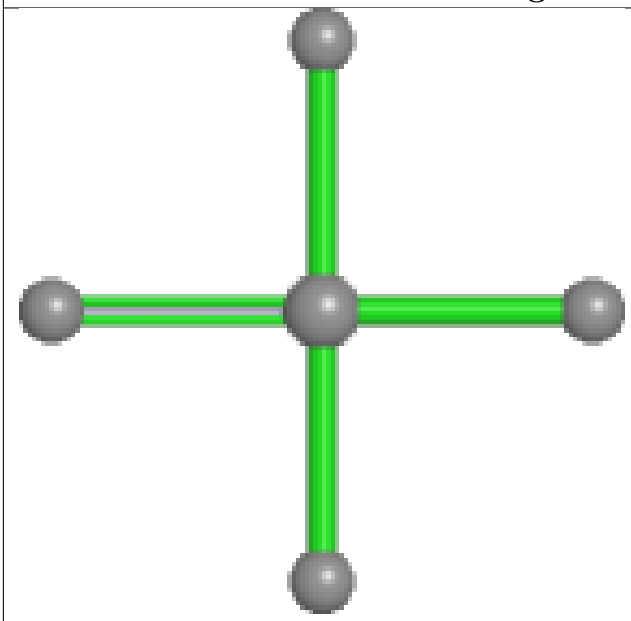


Torsions

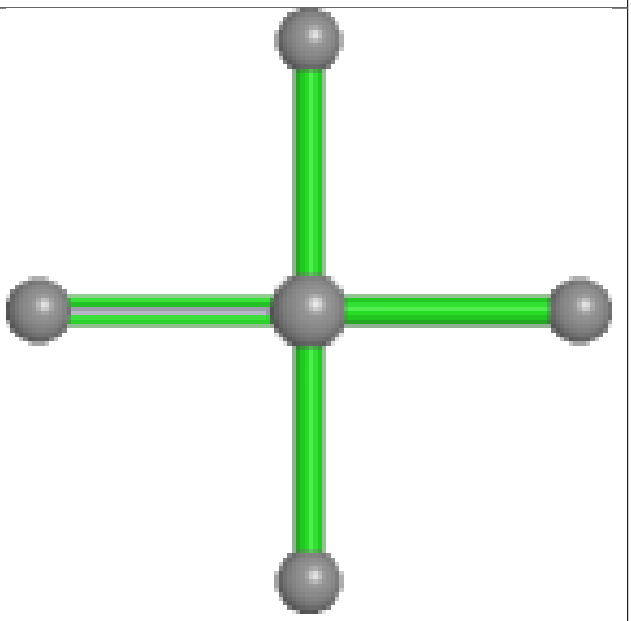


Rings

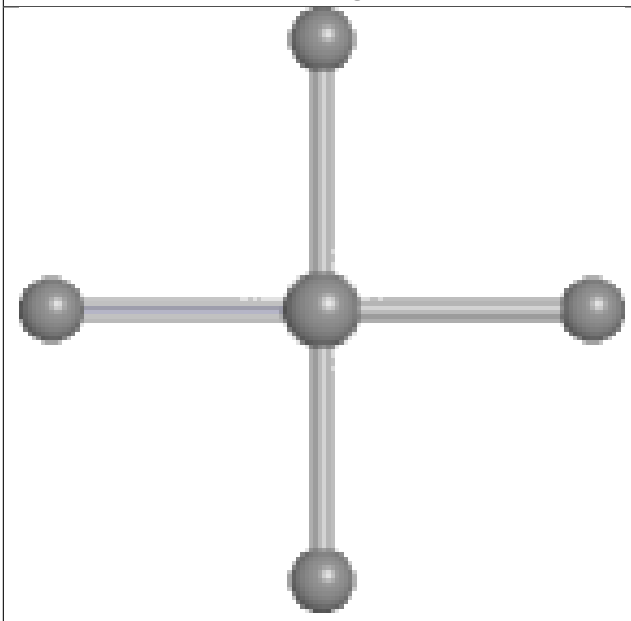
Ligand SO4 G 101



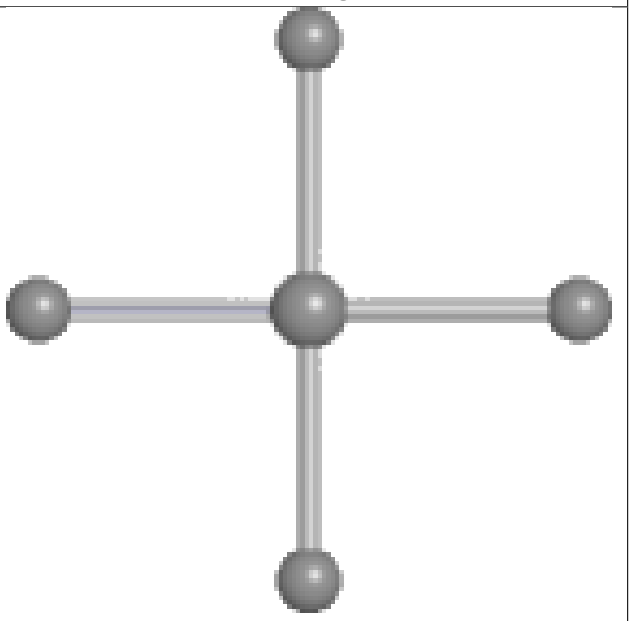
Bond lengths



Bond angles

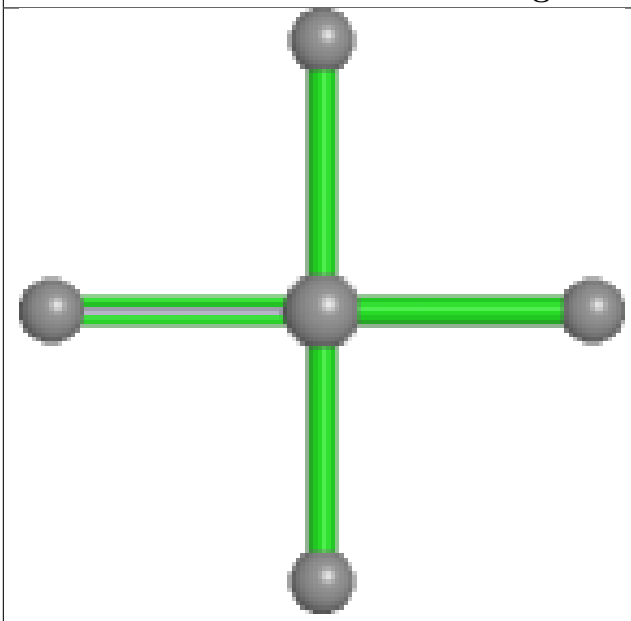


Torsions

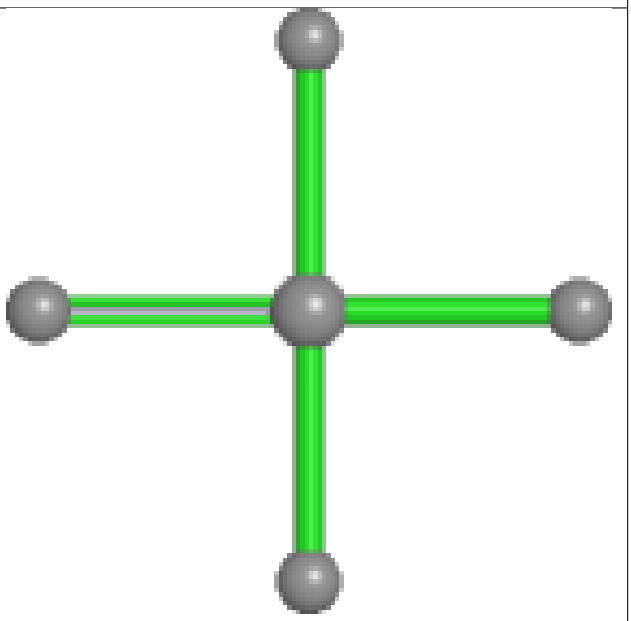


Rings

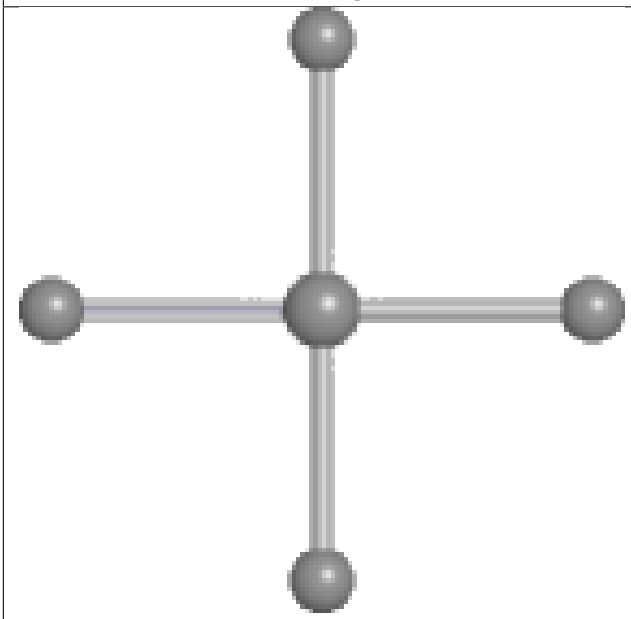
Ligand SO4 J 101



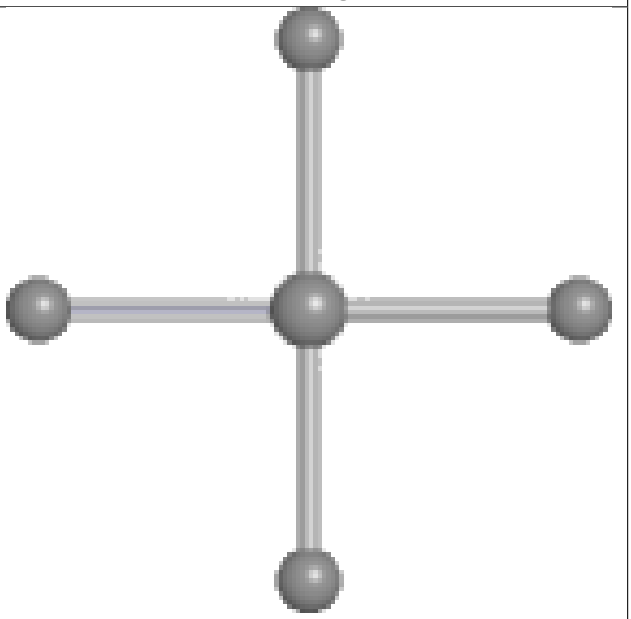
Bond lengths



Bond angles

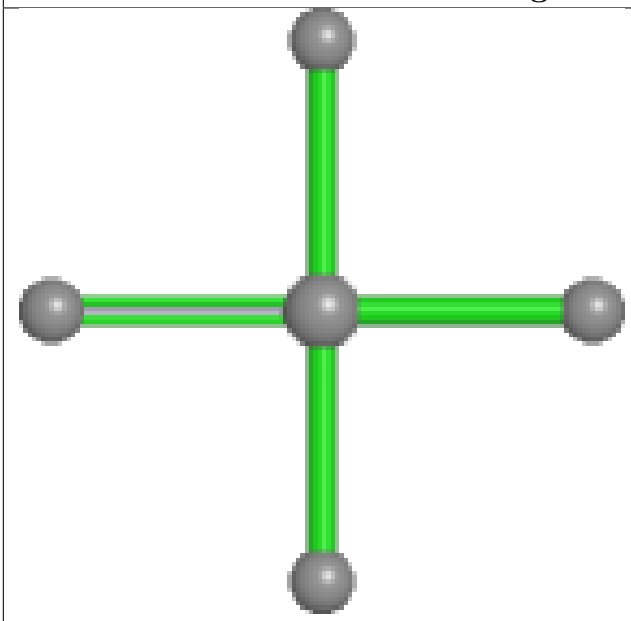


Torsions

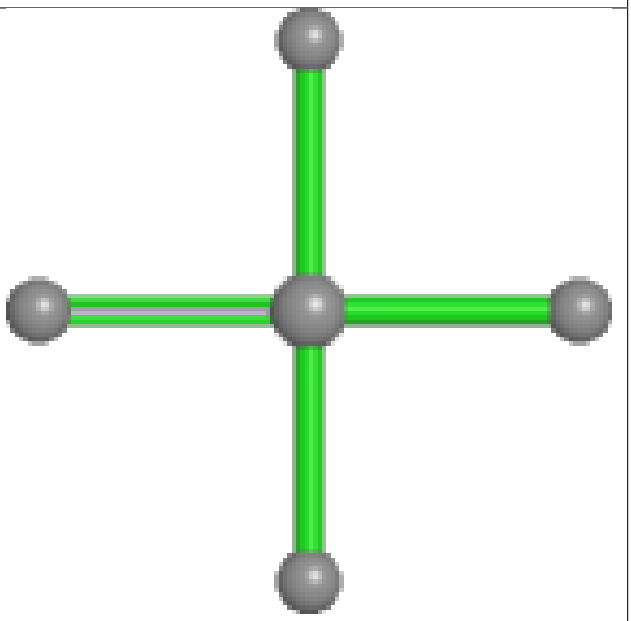


Rings

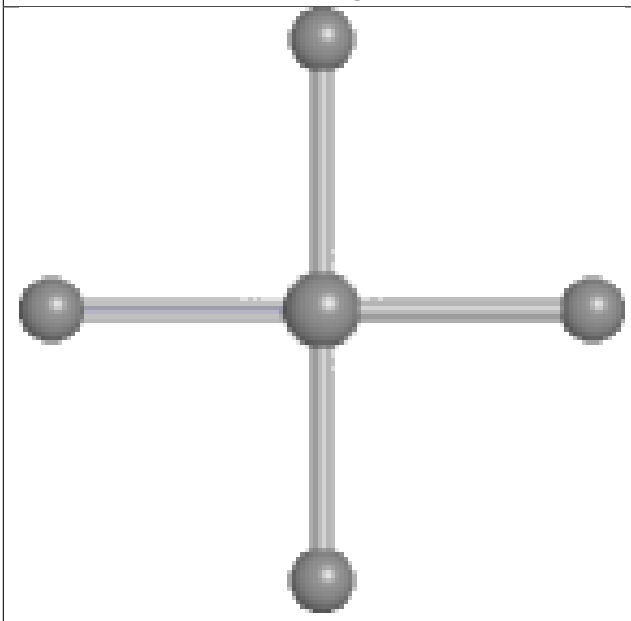
Ligand SO4 E 203



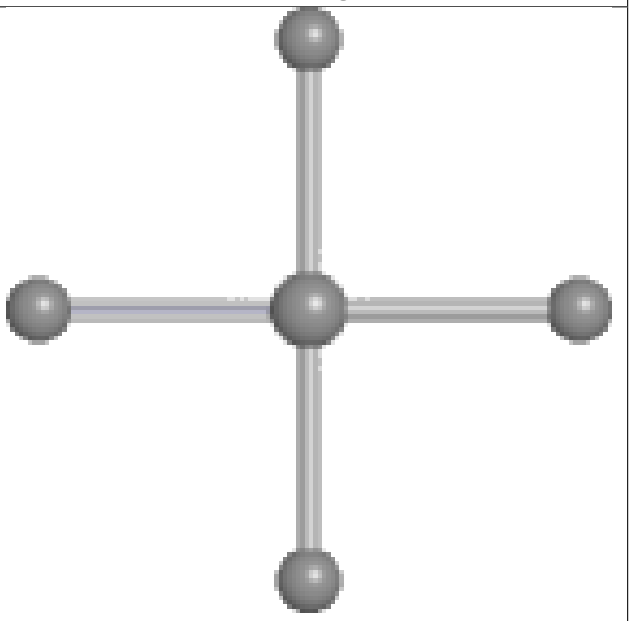
Bond lengths



Bond angles

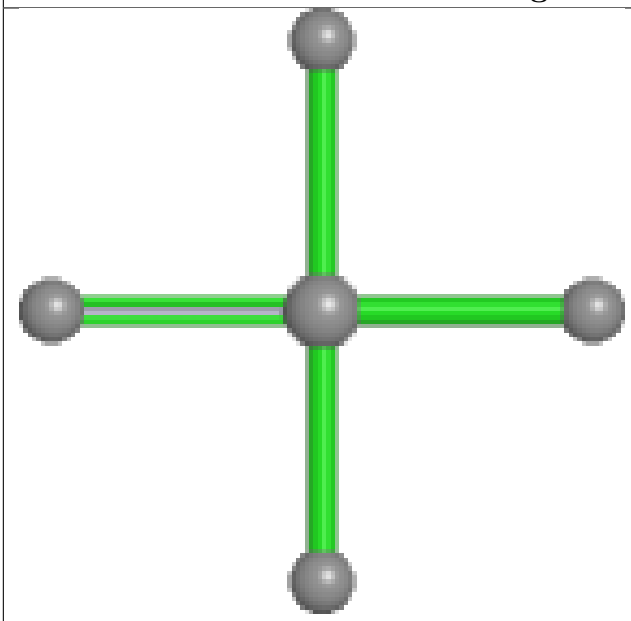


Torsions

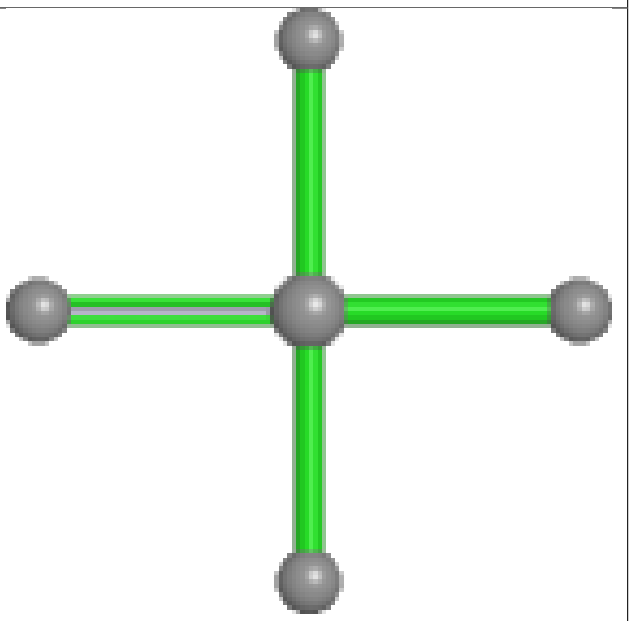


Rings

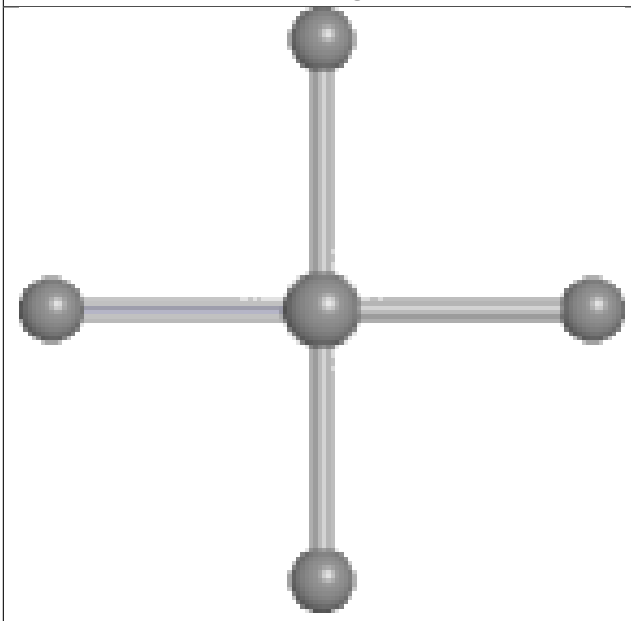
Ligand SO4 E 202



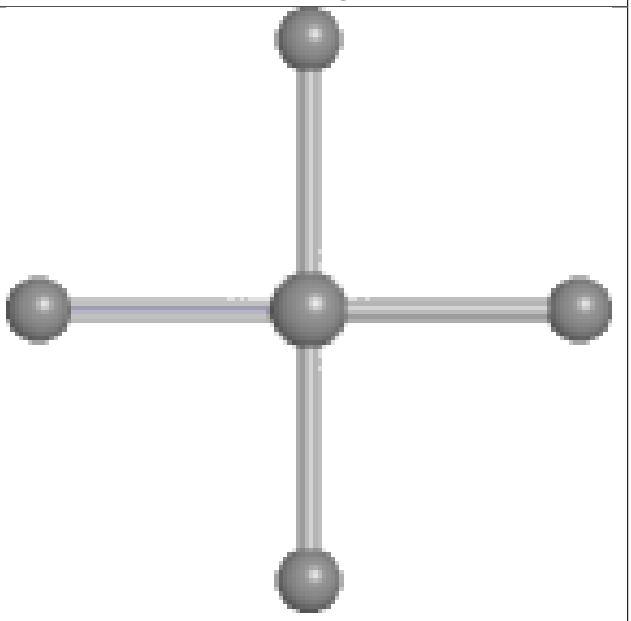
Bond lengths



Bond angles

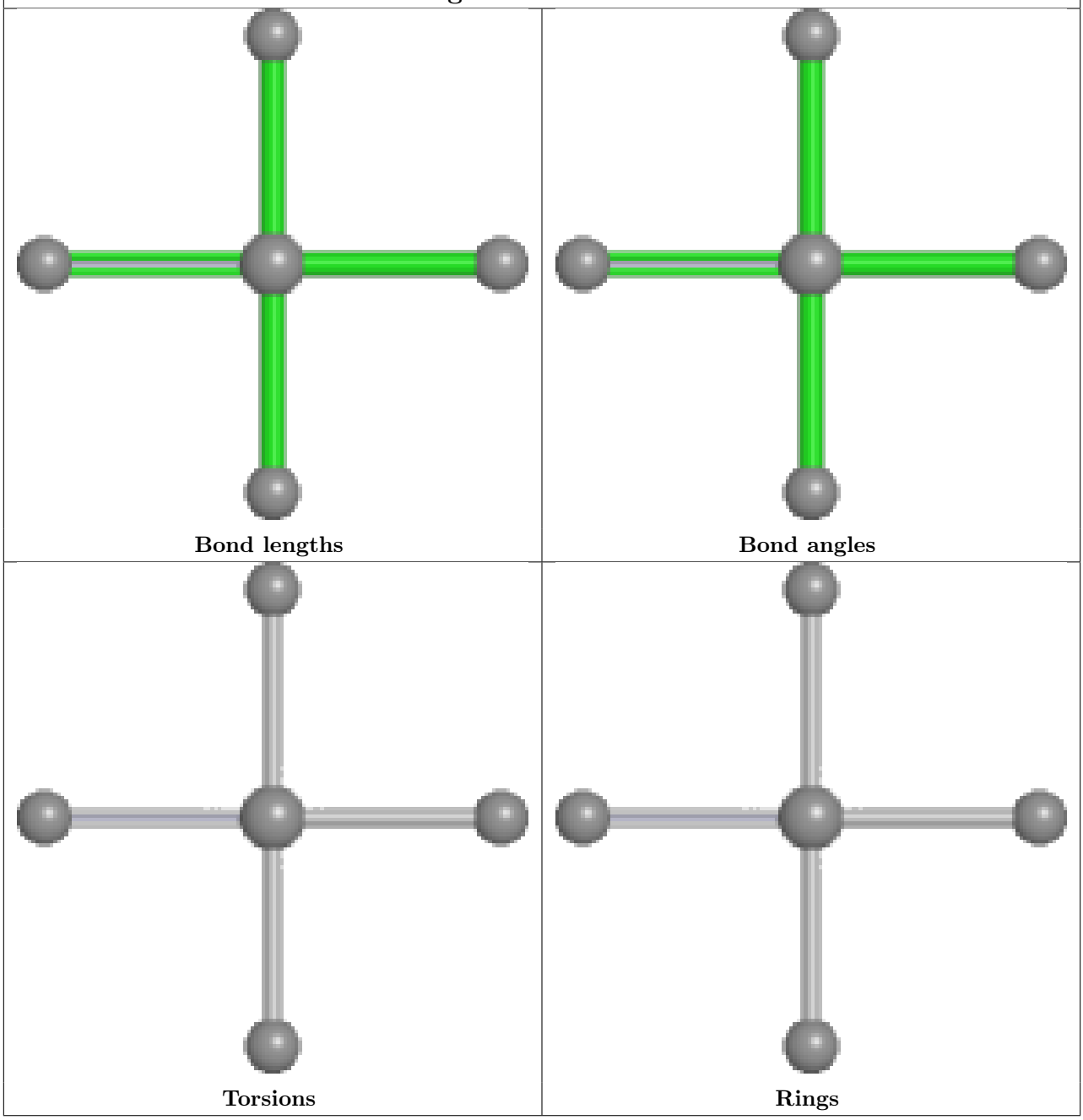


Torsions



Rings

Ligand SO4 B 201



5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	101/101 (100%)	-0.97	0	100	100	11, 18, 33, 38	2 (1%)
1	B	101/101 (100%)	-1.00	0	100	100	8, 19, 32, 37	3 (2%)
1	C	101/101 (100%)	-0.97	0	100	100	8, 19, 31, 38	3 (2%)
1	D	101/101 (100%)	-0.99	0	100	100	9, 19, 32, 37	2 (1%)
1	E	101/101 (100%)	-0.82	0	100	100	11, 24, 35, 41	2 (1%)
1	F	98/101 (97%)	-0.85	0	100	100	12, 25, 36, 39	1 (1%)
2	G	13/17 (76%)	-0.97	0	100	100	14, 18, 30, 41	0
2	H	13/17 (76%)	-0.93	0	100	100	13, 17, 36, 37	0
2	I	13/17 (76%)	-1.02	0	100	100	12, 17, 26, 35	0
2	J	13/17 (76%)	-1.08	0	100	100	13, 16, 28, 35	0
2	K	13/17 (76%)	-0.61	0	100	100	19, 27, 53, 58	0
2	L	12/17 (70%)	-0.61	0	100	100	20, 30, 46, 47	0
All	All	680/708 (96%)	-0.93	0	100	100	8, 21, 35, 58	13 (1%)

There are no RSRZ outliers to report.

6.2 Non-standard residues in protein, DNA, RNA chains

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	NLE	K	8	8/9	0.96	0.06	24,26,31,32	0
2	HRG	J	11	12/13	0.98	0.05	14,17,21,21	0
2	HRG	K	11	12/13	0.98	0.04	23,28,33,34	0

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	HRG	L	11	12/13	0.98	0.05	25,31,35,36	0
2	HRG	I	11	12/13	0.98	0.04	14,18,24,25	0
2	HRG	H	11	12/13	0.99	0.03	14,16,24,25	0
2	NLE	G	8	8/9	0.99	0.04	15,17,23,25	0
2	NLE	H	8	8/9	0.99	0.04	14,15,22,24	0
2	NLE	I	8	8/9	0.99	0.03	13,14,20,23	0
2	NLE	J	8	8/9	0.99	0.04	13,15,20,20	0
2	HRG	G	11	12/13	0.99	0.03	14,17,26,27	0
2	NLE	L	8	8/9	0.99	0.05	26,31,34,35	0

6.3 Carbohydrates (i)

There are no oligosaccharides in this entry.

6.4 Ligands (i)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	SO4	E	202	5/5	0.94	0.08	91,91,91,91	0
3	SO4	C	201	5/5	0.97	0.07	69,69,69,69	0
3	SO4	D	203	5/5	0.97	0.08	93,93,93,93	0
3	SO4	E	201	5/5	0.97	0.05	53,53,53,53	0
3	SO4	A	204	5/5	0.97	0.08	85,85,85,85	0
3	SO4	G	101	5/5	0.97	0.07	83,83,83,83	0
3	SO4	A	201	5/5	0.98	0.04	42,43,43,44	0
3	SO4	B	202	5/5	0.98	0.04	66,66,66,66	0
3	SO4	A	203	5/5	0.98	0.06	36,36,37,37	0
3	SO4	F	201	5/5	0.98	0.05	71,72,72,72	0
3	SO4	D	202	5/5	0.98	0.05	59,59,60,60	0
3	SO4	J	101	5/5	0.98	0.07	40,41,41,42	0
3	SO4	L	101	5/5	0.98	0.04	50,50,50,50	0
3	SO4	E	203	5/5	0.99	0.04	35,35,35,36	0
3	SO4	A	202	5/5	0.99	0.04	25,26,27,27	0
3	SO4	B	201	5/5	0.99	0.03	26,26,27,27	0
3	SO4	C	202	5/5	0.99	0.04	44,44,45,45	0
3	SO4	D	201	5/5	0.99	0.05	29,29,30,30	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

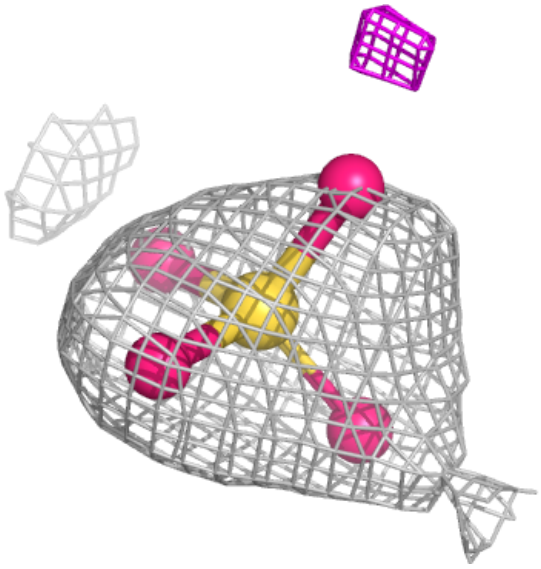
Electron density around SO4 E 202:

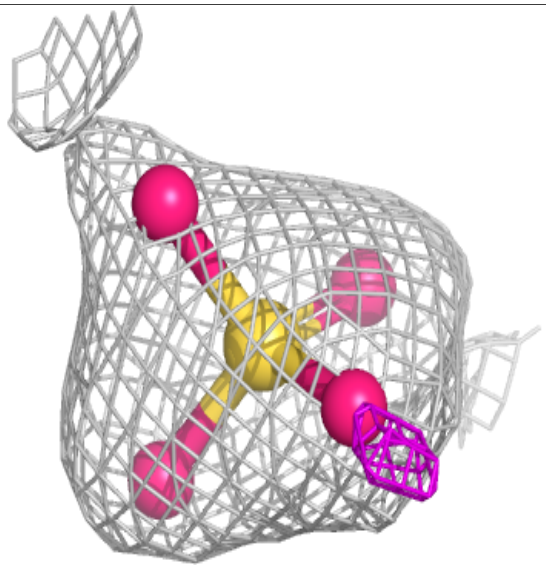
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

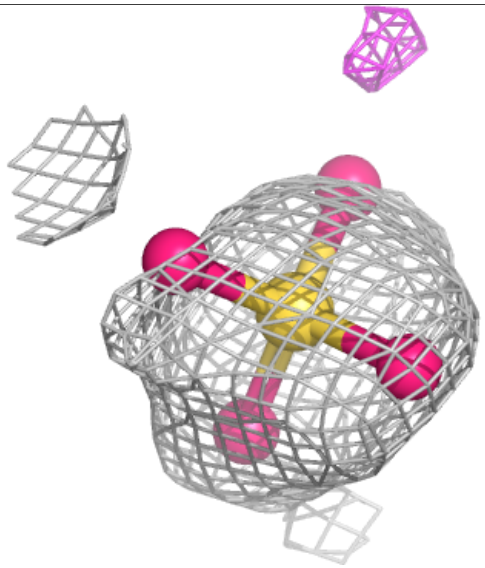


Electron density around SO4 C 201:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

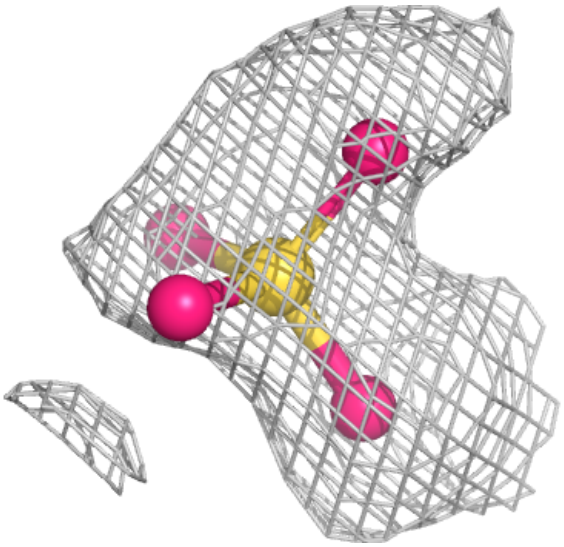


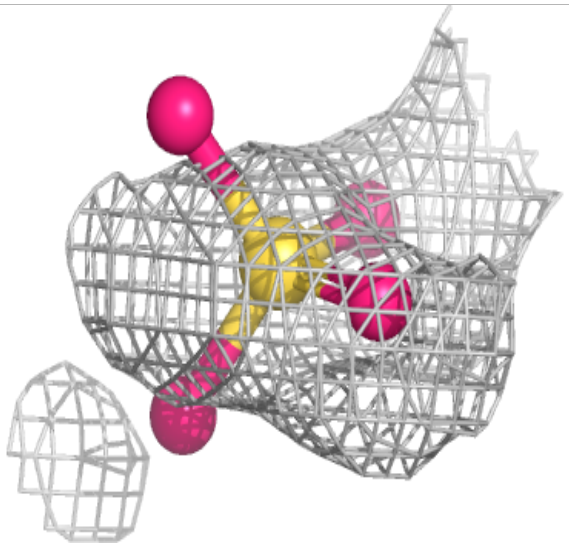


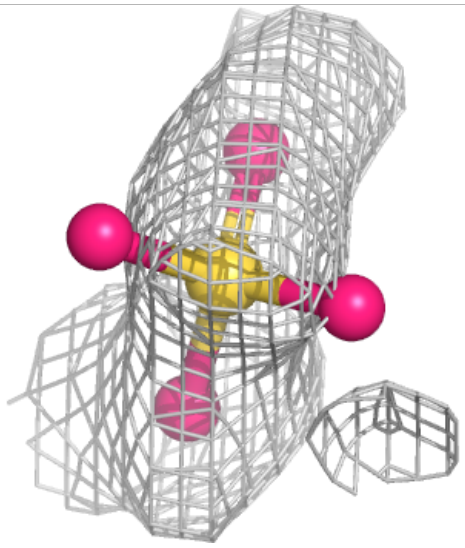


Electron density around SO4 D 203:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

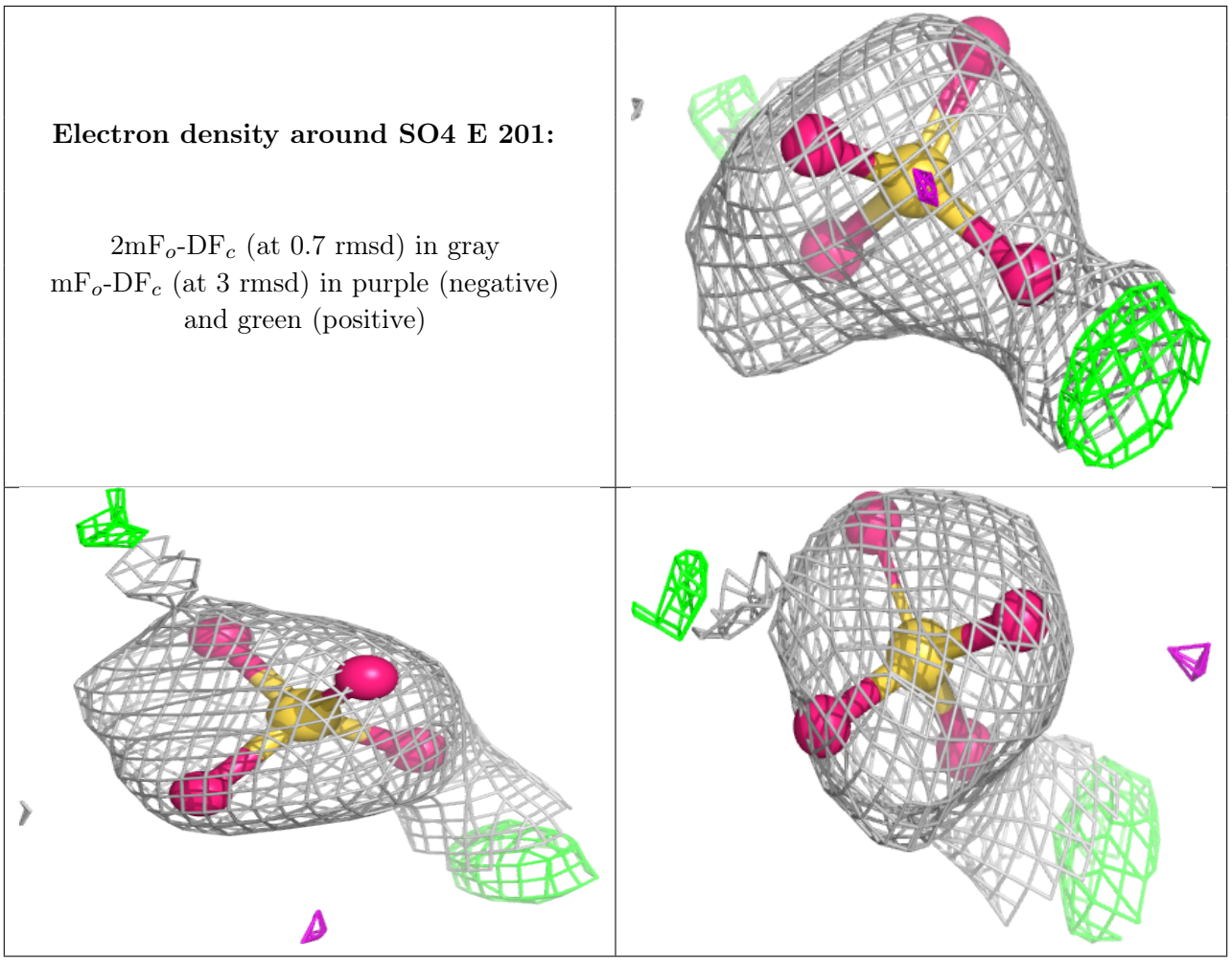






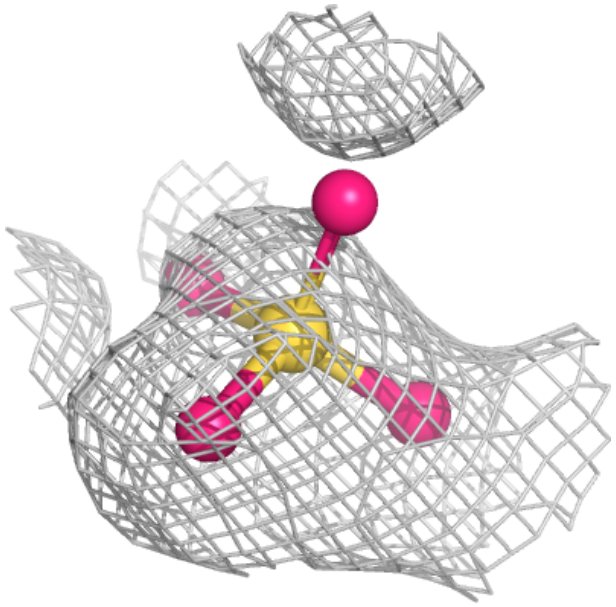
Electron density around SO4 E 201:

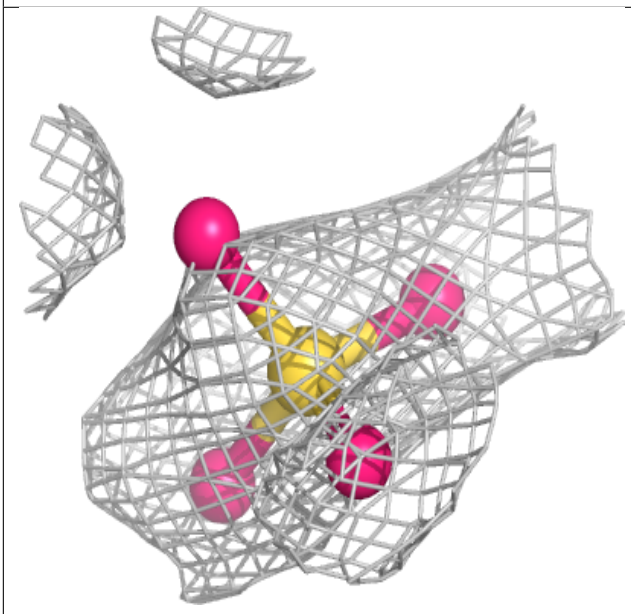
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

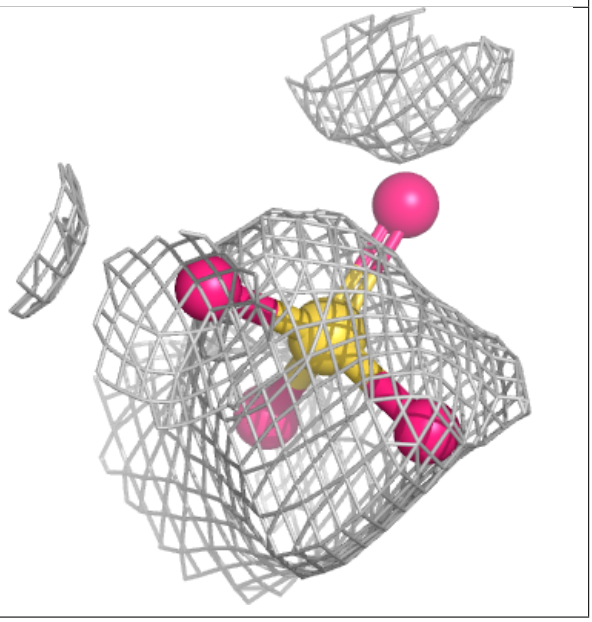


Electron density around SO4 A 204:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

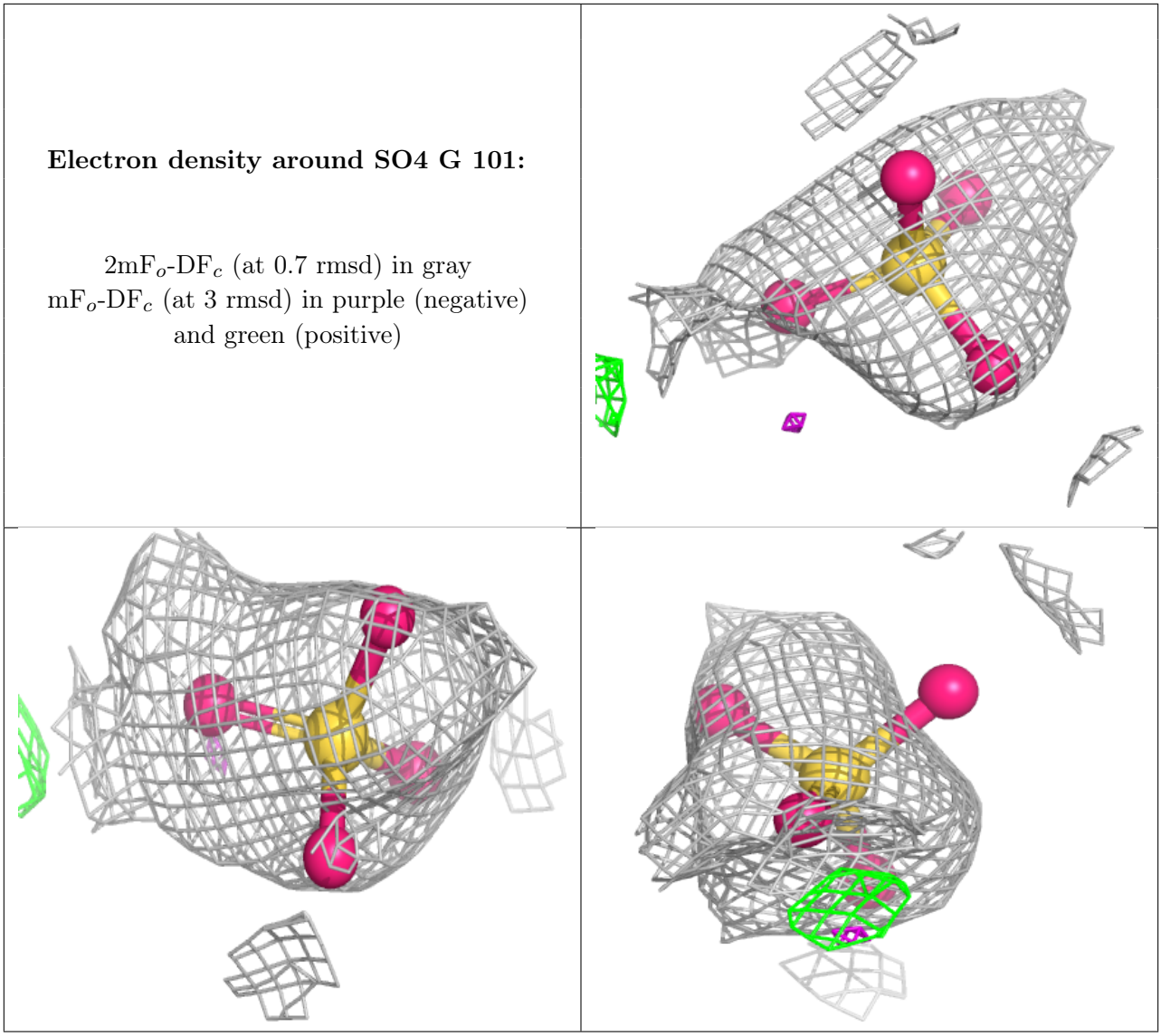






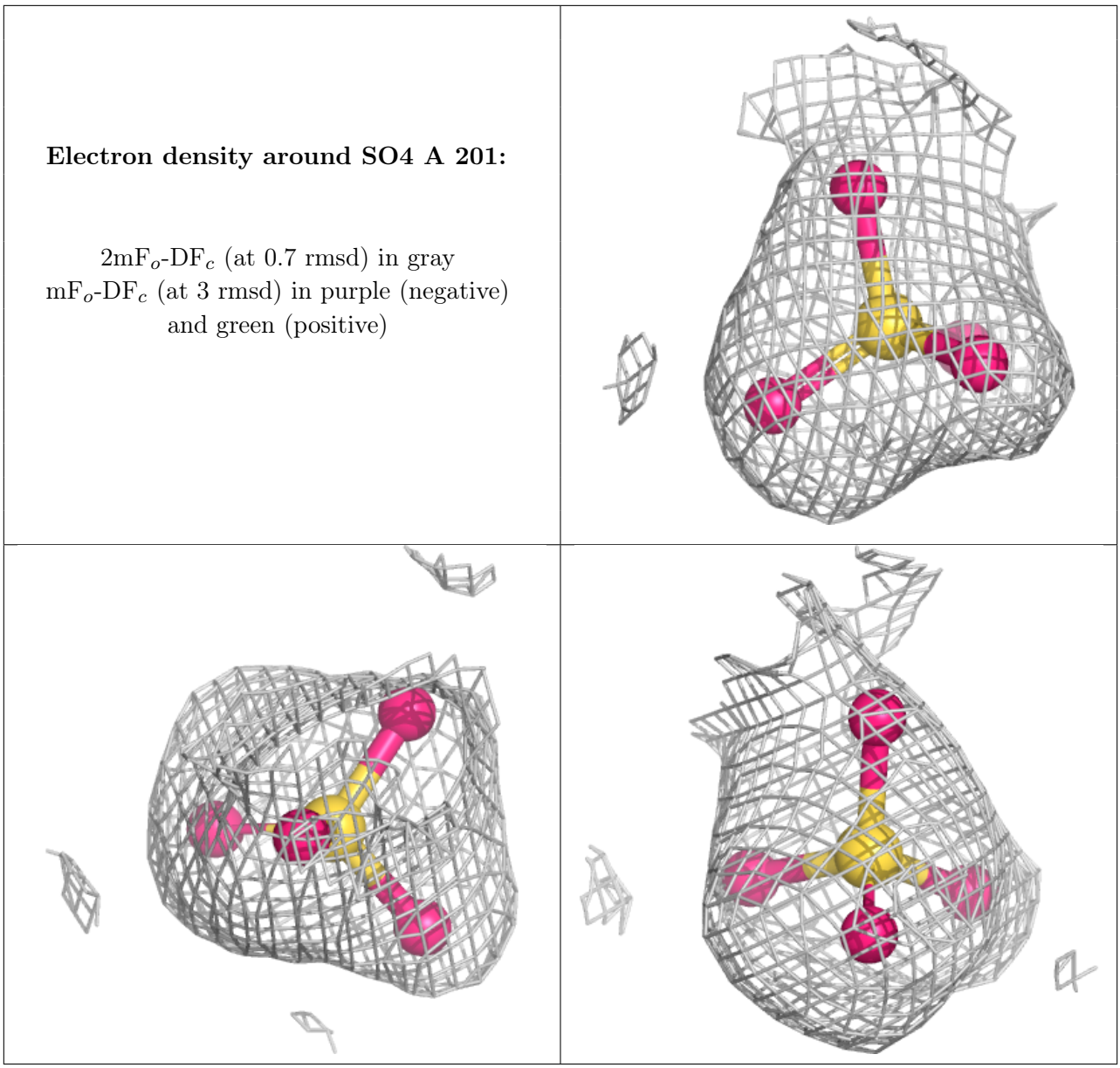
Electron density around SO4 G 101:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



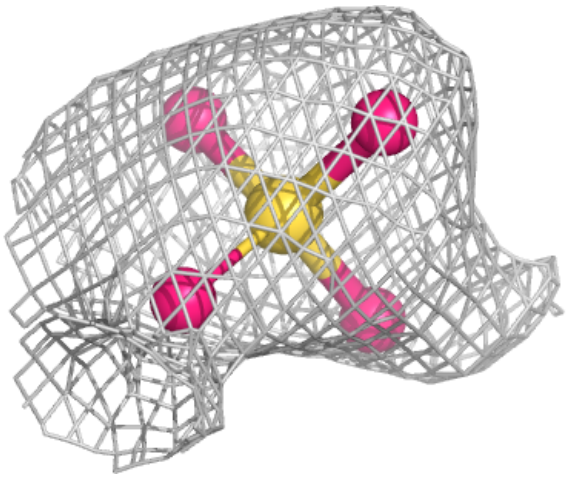
Electron density around SO4 A 201:

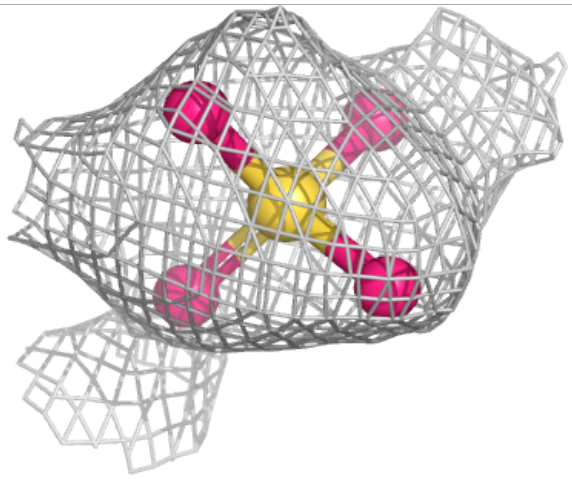
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

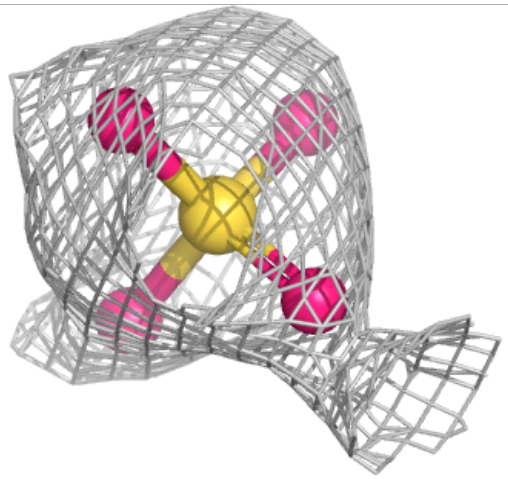


Electron density around SO4 B 202:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

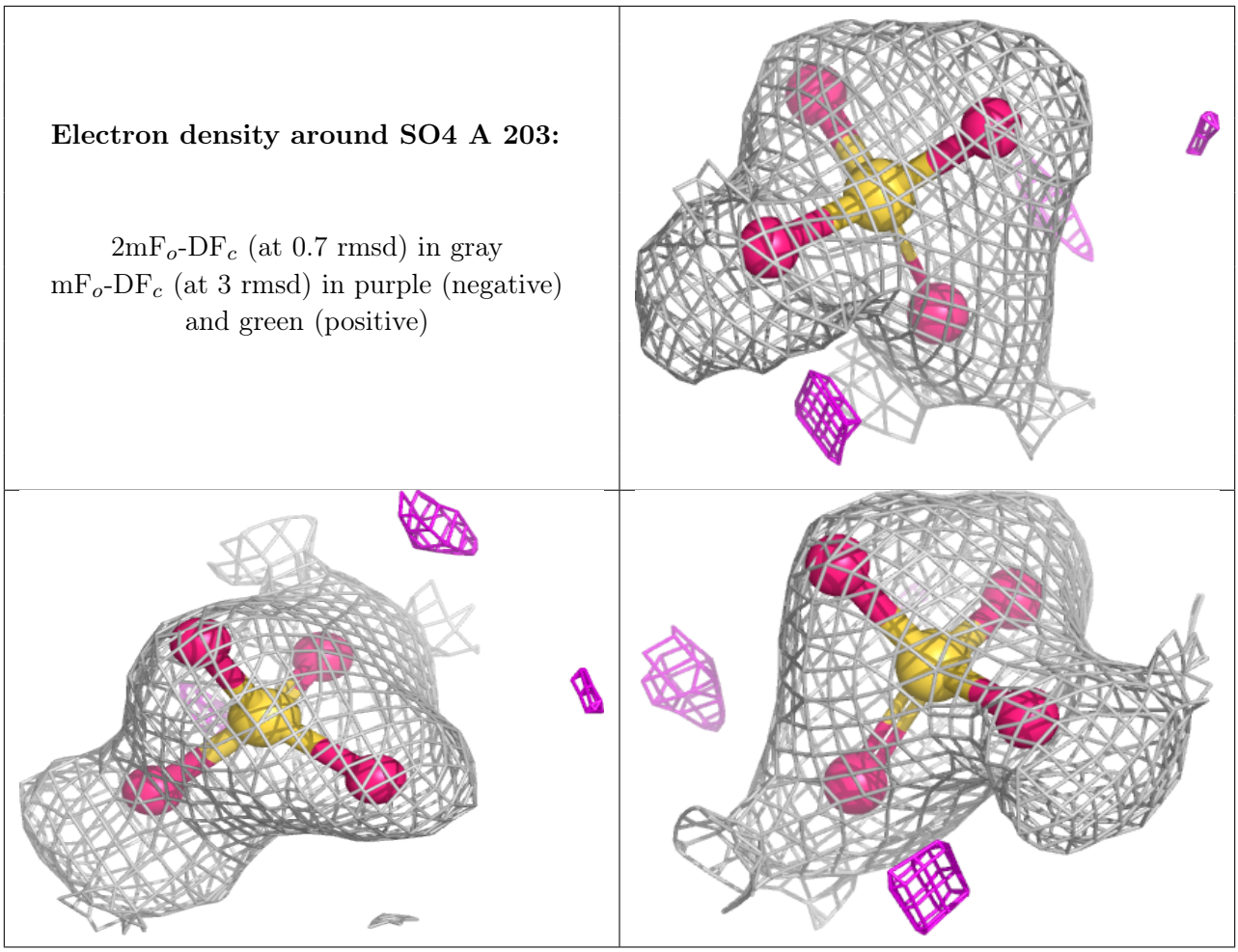






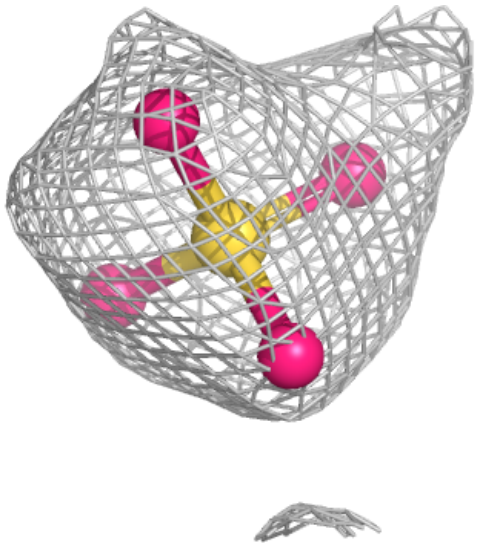
Electron density around SO4 A 203:

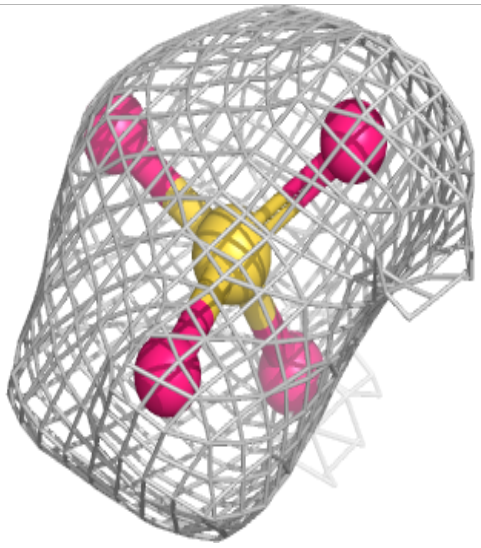
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

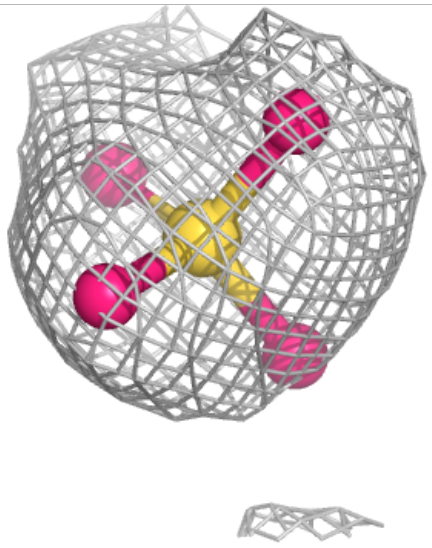


Electron density around SO4 F 201:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

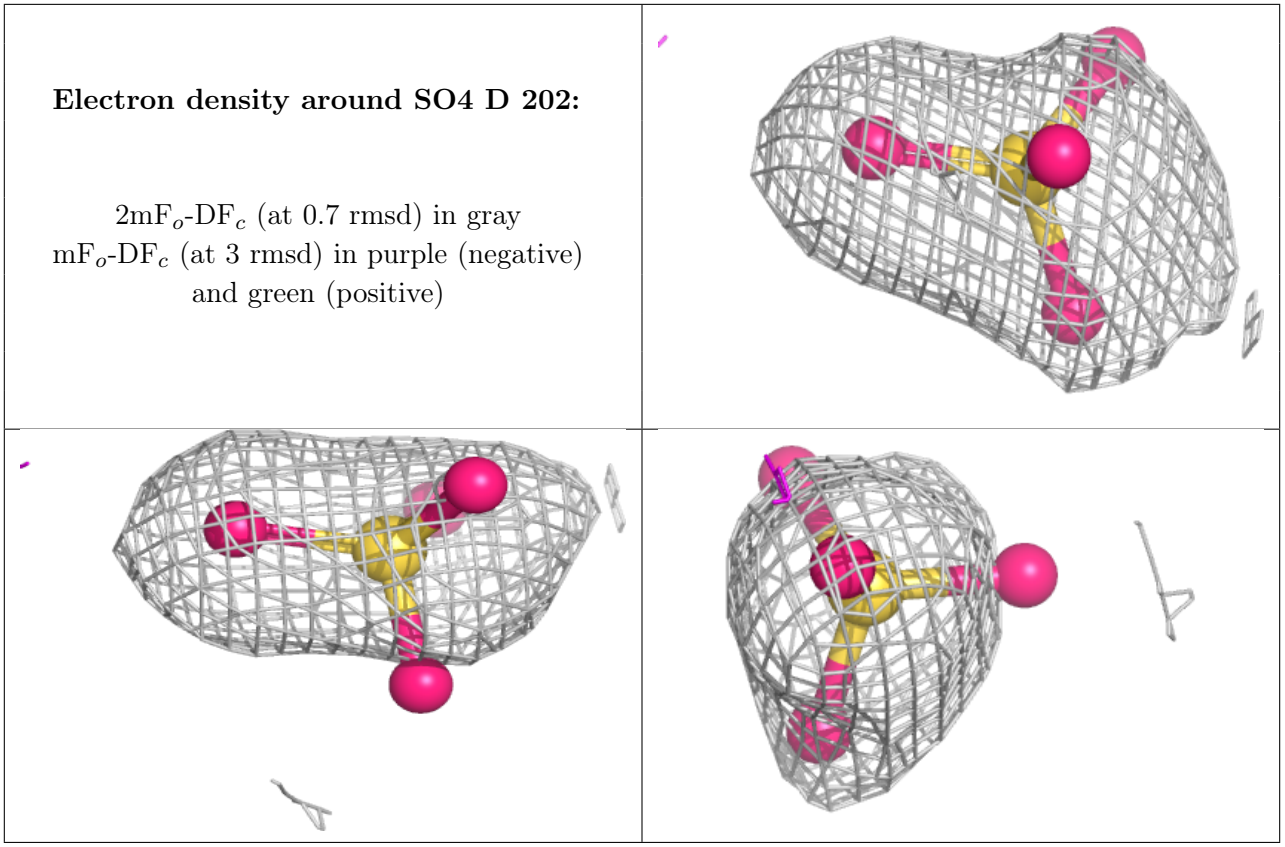






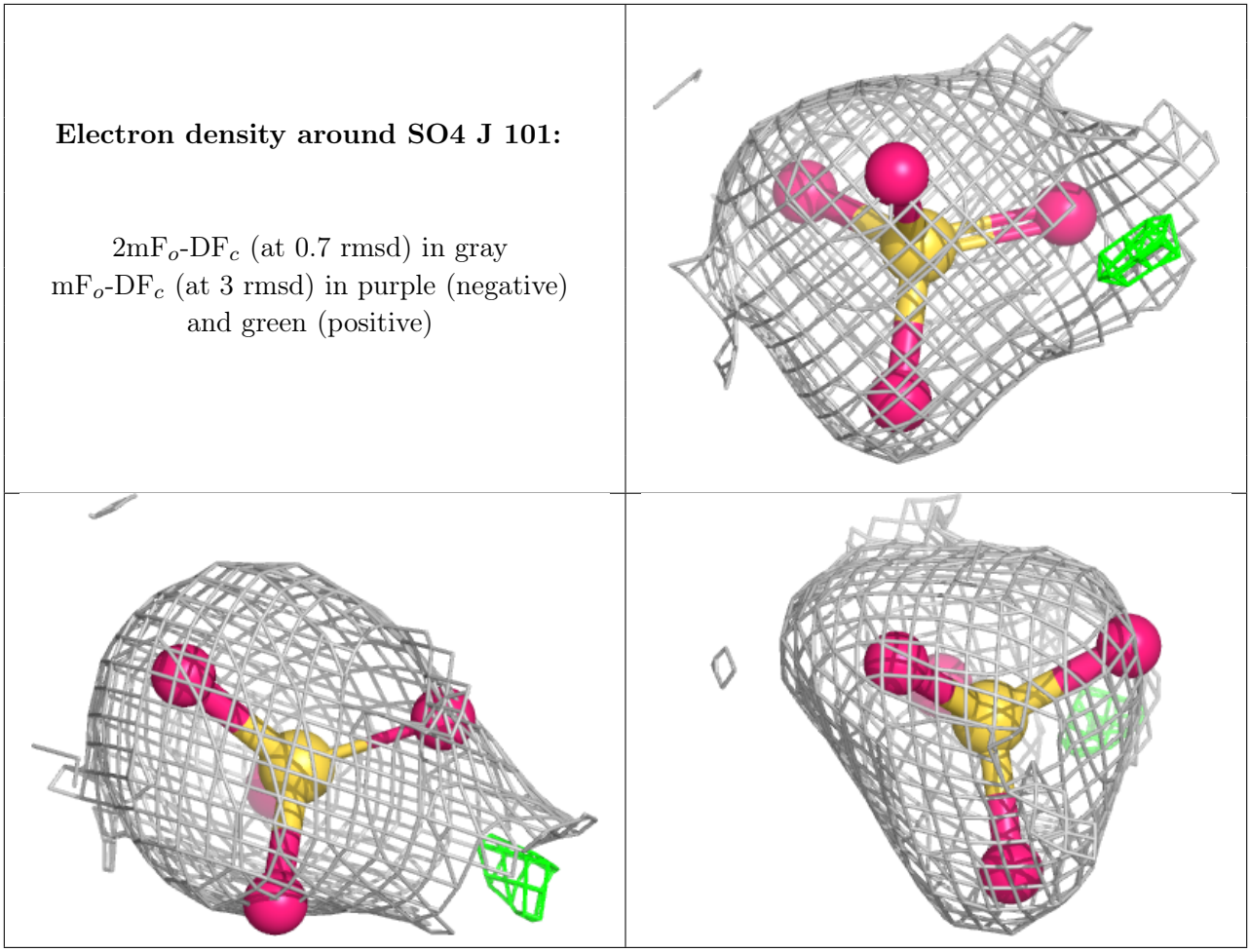
Electron density around SO4 D 202:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



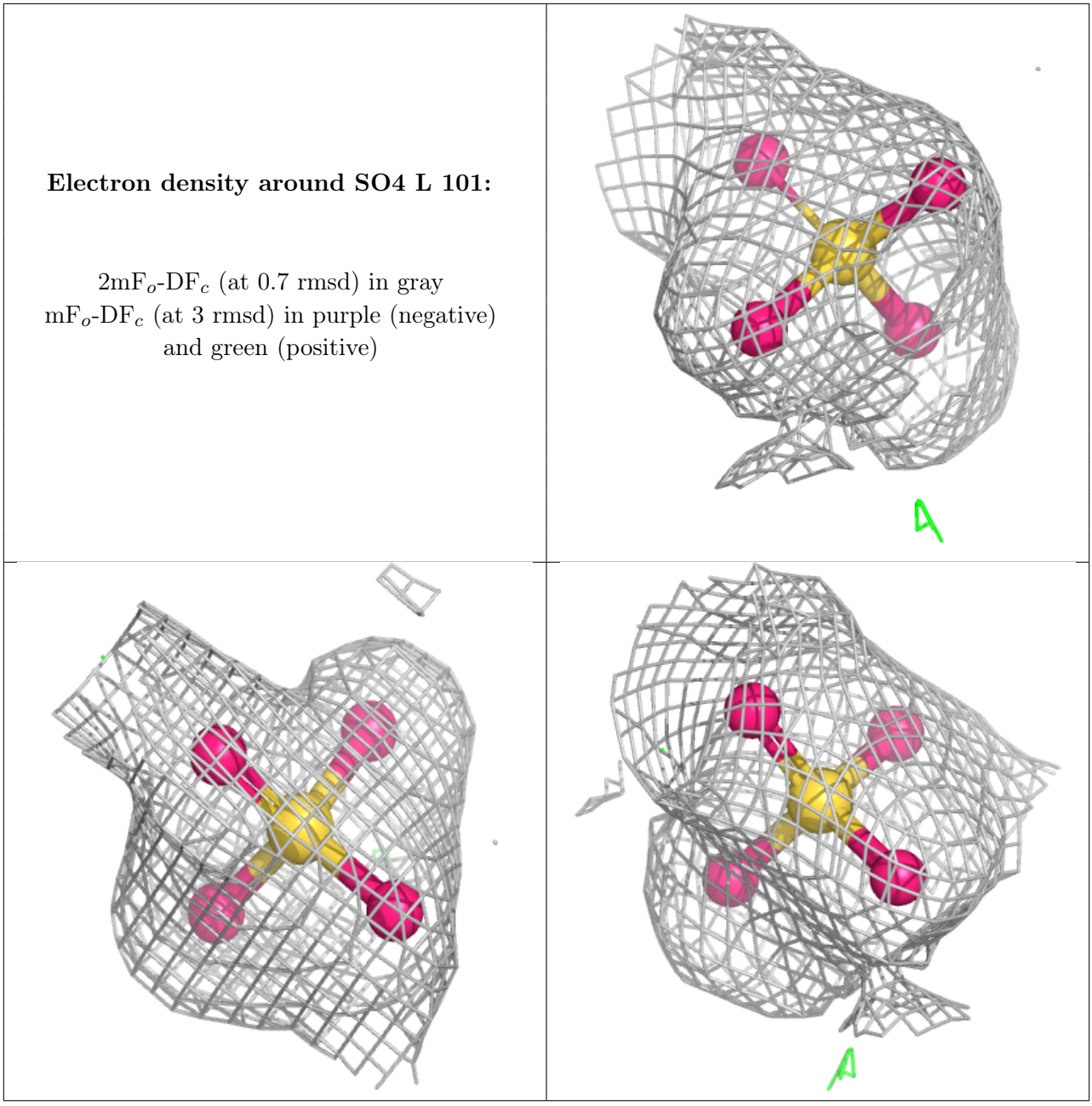
Electron density around SO4 J 101:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



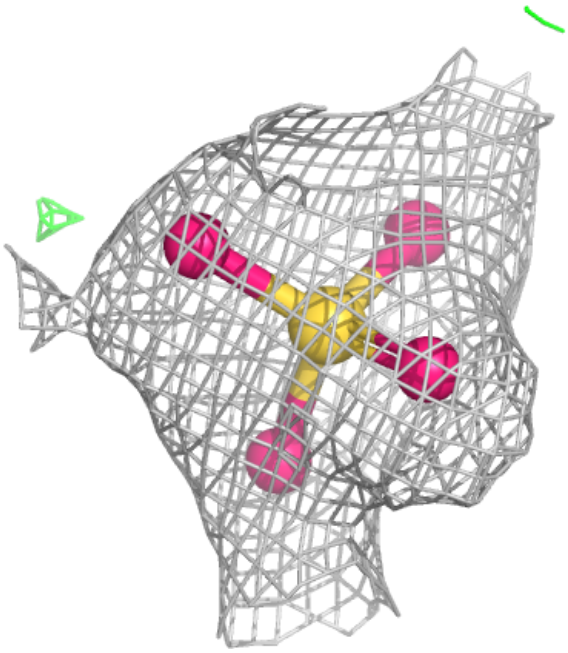
Electron density around SO4 L 101:

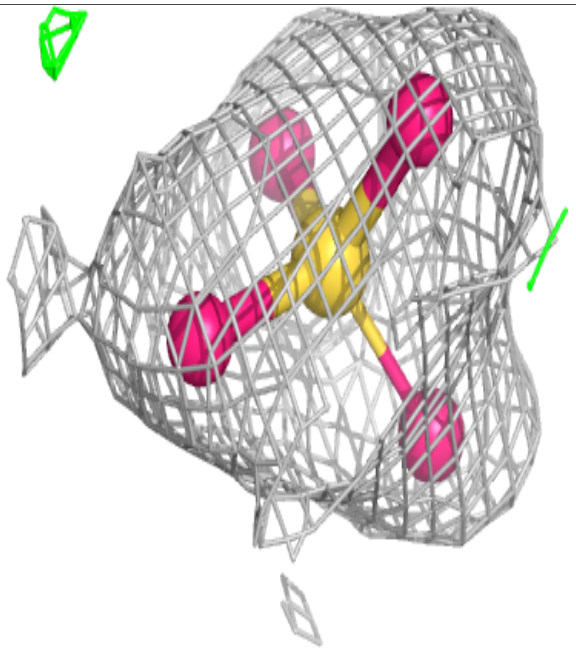
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

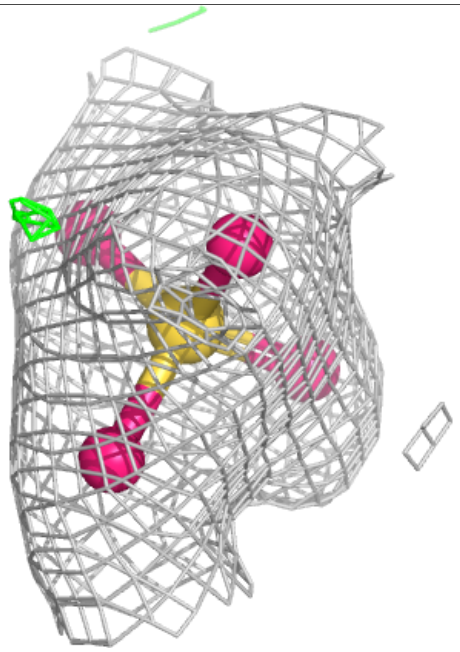


Electron density around SO4 E 203:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

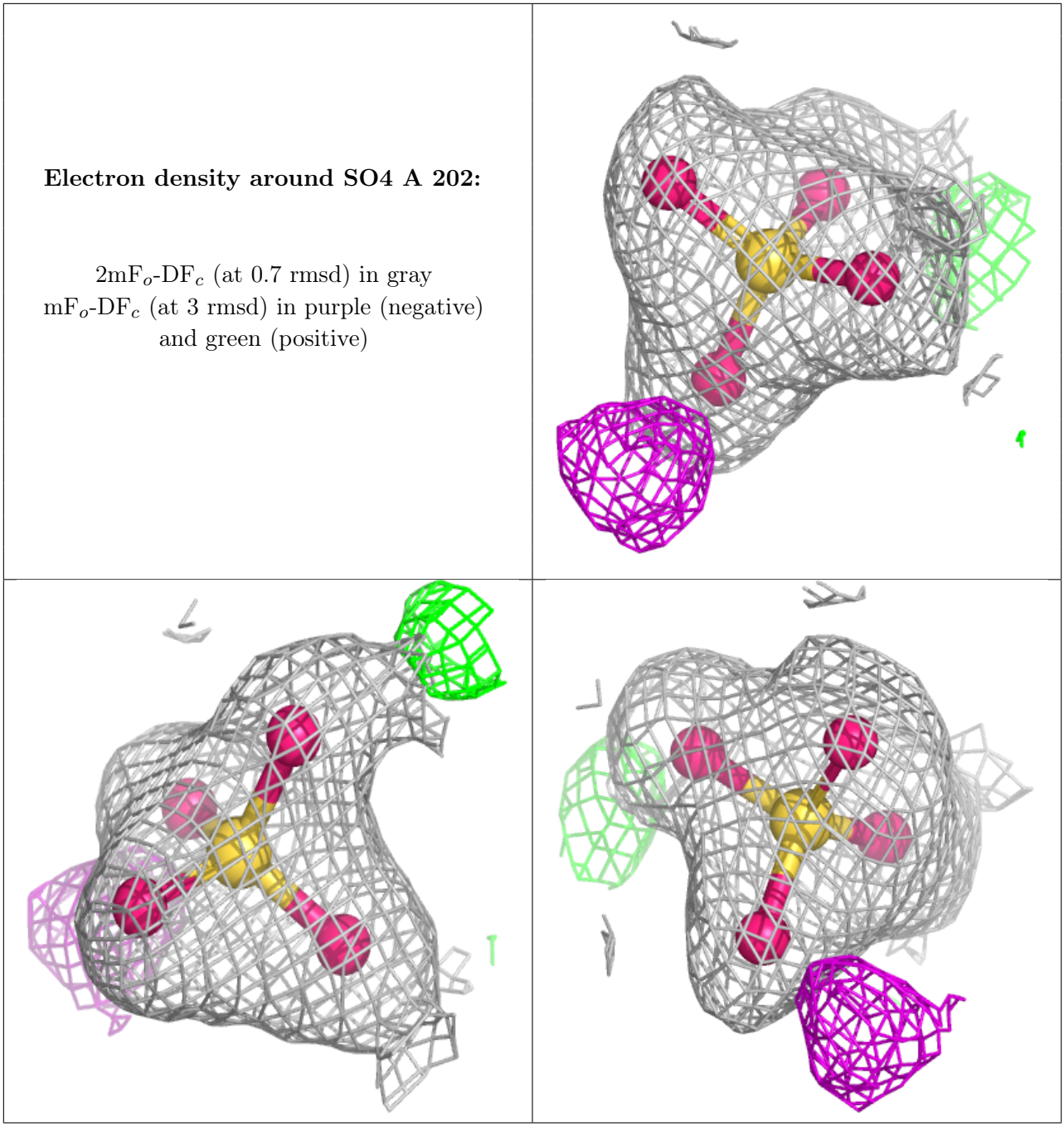






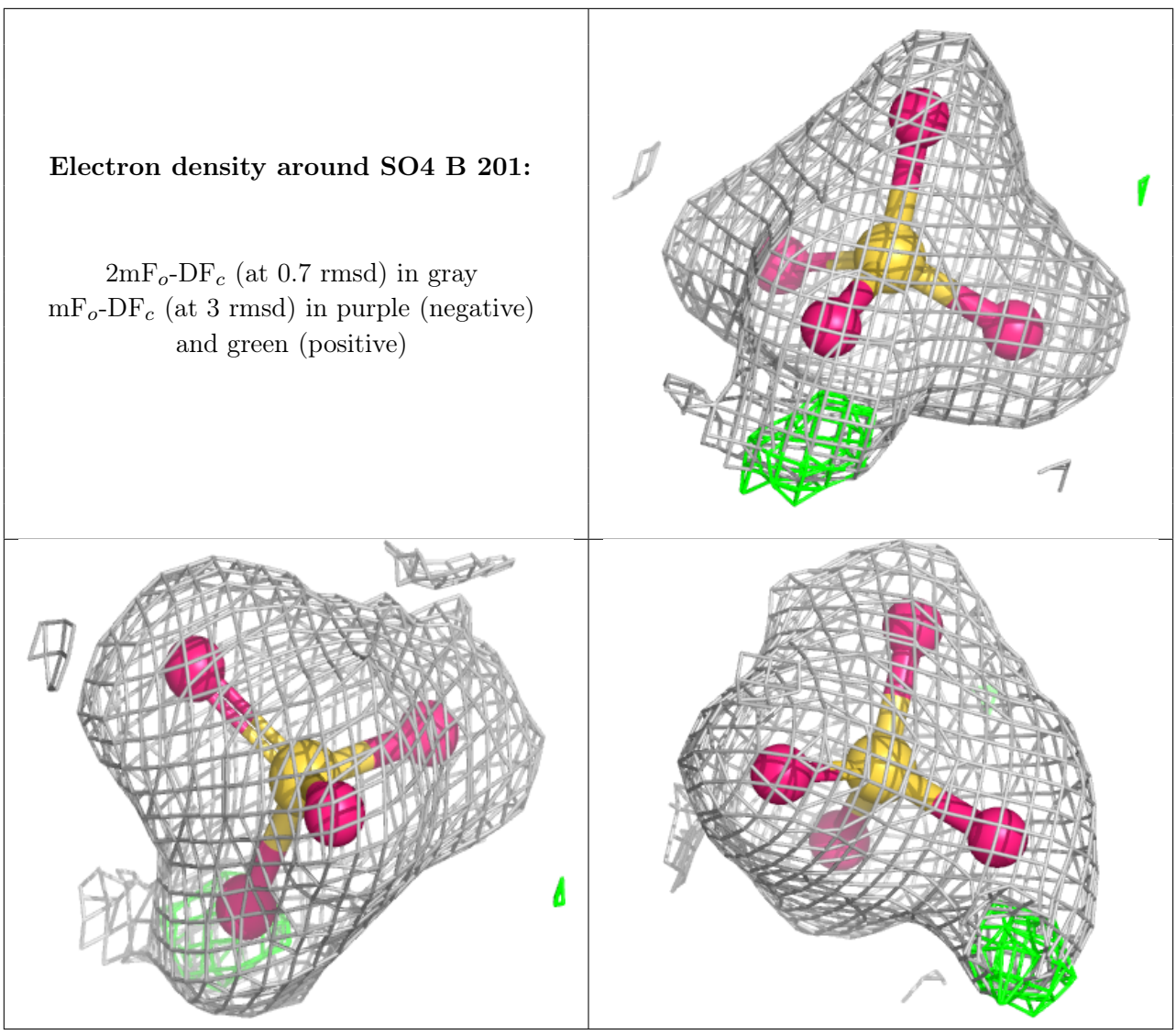
Electron density around SO4 A 202:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



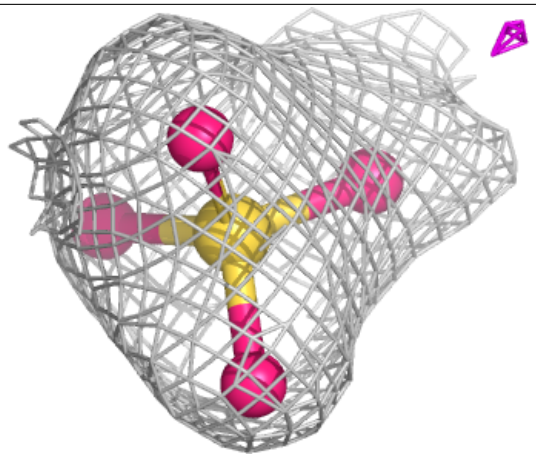
Electron density around SO4 B 201:

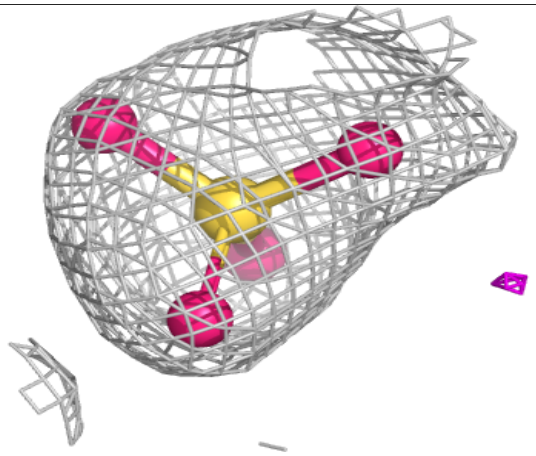
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

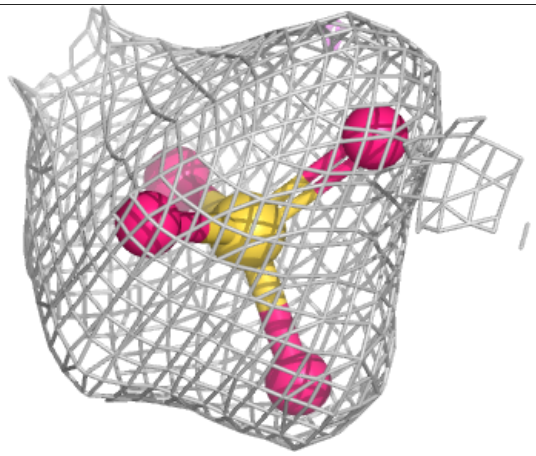


Electron density around SO4 C 202:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

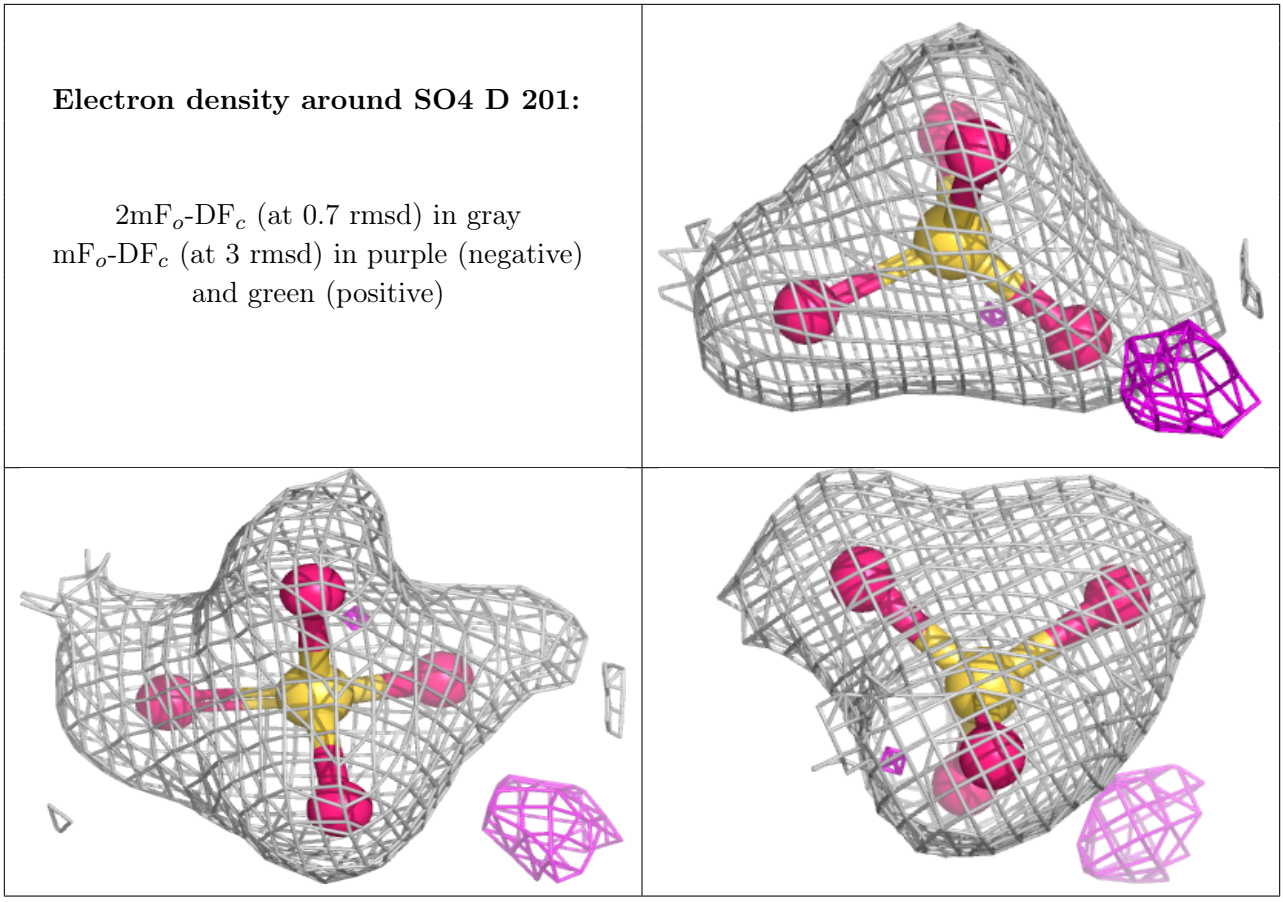






Electron density around SO4 D 201:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



6.5 Other polymers

There are no such residues in this entry.