



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 05:51 AM UTC

PDB ID : 1M70 / pdb_00001m70
Title : Crystal structure of oxidized recombinant cytochrome c4 from *Pseudomonas stutzeri*
Authors : Noergaard, A.; Harris, P.; Larsen, S.; Christensen, H.E.M.
Deposited on : 2002-07-18
Resolution : 1.25 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

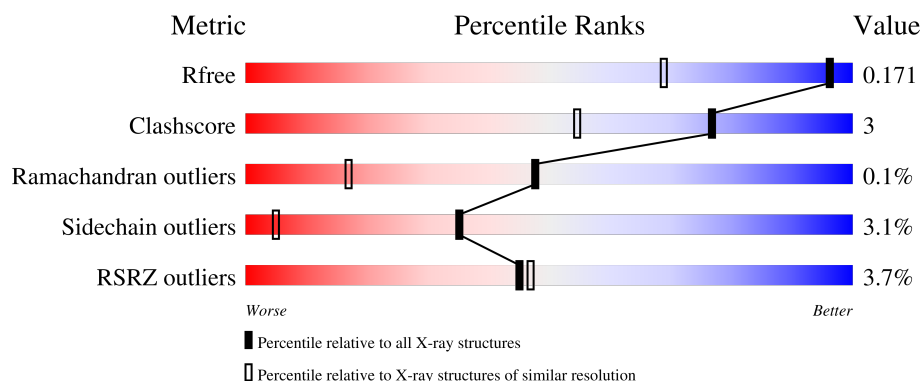
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.25 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	1693 (1.28-1.24)
Clashscore	190562	1730 (1.28-1.24)
Ramachandran outliers	187476	1695 (1.28-1.24)
Sidechain outliers	187428	1694 (1.28-1.24)
RSRZ outliers	180081	1693 (1.28-1.24)

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 $\leq 5\%$. 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	190	3% 91% 9% .
1	B	190	5% 88% 10% ..
1	C	190	4% 92% 6% ..
1	D	190	4% 93% 6% .

2 Entry composition [i](#)

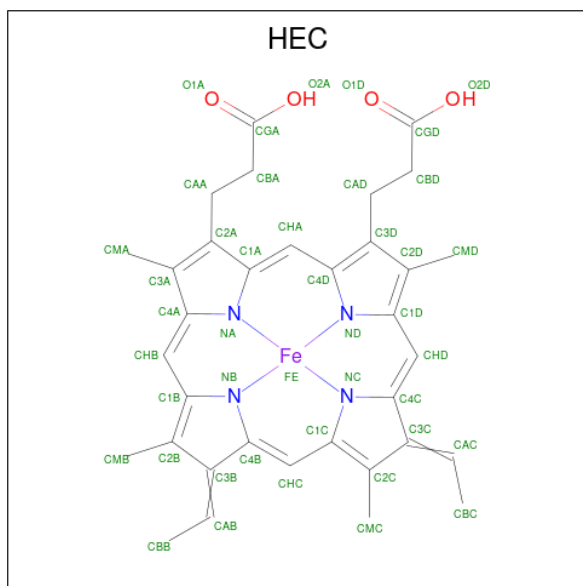
There are 4 unique types of molecules in this entry. The entry contains 6717 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Cytochrome c4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	190	Total	C	N	O	S	0	3	0
			1390	857	248	275	10			
1	B	190	Total	C	N	O	S	0	2	0
			1386	852	248	277	9			
1	C	190	Total	C	N	O	S	0	4	0
			1390	856	247	278	9			
1	D	190	Total	C	N	O	S	0	1	0
			1382	851	247	274	10			

- Molecule 2 is HEME C (CCD ID: HEC) (formula: $C_{34}H_{34}FeN_4O_4$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
2	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	C	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	C	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	D	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	D	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	212	Total	O	0	0
			212	212		
4	B	170	Total	O	0	0
			170	170		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	C	214	Total 214	O 214	0	0
4	D	223	Total 223	O 223	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: Cytochrome c4

Chain A: 



• Molecule 1: Cytochrome c4

Chain B: 

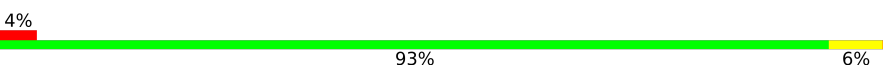


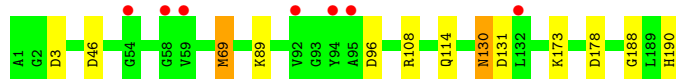
• Molecule 1: Cytochrome c4

Chain C: 



• Molecule 1: Cytochrome c4

Chain D: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	74.96Å 57.64Å 84.41Å 90.00° 104.23° 90.00°	Depositor
Resolution (Å)	30.00 – 1.25 30.00 – 1.25	Depositor EDS
% Data completeness (in resolution range)	88.8 (30.00-1.25) 89.0 (30.00-1.25)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.35 (at 1.25Å)	Xtriage
Refinement program	SHELXL-97	Depositor
R, R_{free}	0.155 , 0.202 0.160 , 0.171	Depositor DCC
R_{free} test set	8596 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	14.5	Xtriage
Anisotropy	0.223	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 40.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	6717	wwPDB-VP
Average B, all atoms (Å ²)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 81.55 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.4565e-07. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ 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: GOL, HEC

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	0.74	0/1425	1.39	15/1916 (0.8%)
1	B	0.72	0/1417	1.45	12/1907 (0.6%)
1	C	0.73	0/1431	1.30	8/1927 (0.4%)
1	D	0.68	0/1409	1.24	6/1895 (0.3%)
All	All	0.72	0/5682	1.35	41/7645 (0.5%)

There are no bond length outliers.

All (41) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	91	SER	CA-C-N	-12.69	108.70	122.27
1	B	91	SER	C-N-CA	-12.69	108.70	122.27
1	A	102	GLN	CA-CB-CG	10.62	135.34	114.10
1	A	165[A]	MET	CA-C-N	8.56	131.32	120.88
1	A	165[A]	MET	C-N-CA	8.56	131.32	120.88
1	A	165[B]	MET	CA-C-N	8.56	131.32	120.88
1	A	165[B]	MET	C-N-CA	8.56	131.32	120.88
1	B	166	ILE	CB-CA-C	-8.55	100.94	111.88
1	B	108	ARG	CA-CB-CG	8.17	130.44	114.10
1	B	157[A]	ASN	CA-CB-CG	-7.74	104.86	112.60
1	B	157[B]	ASN	CA-CB-CG	-7.74	104.86	112.60
1	C	178	ASP	CA-CB-CG	7.53	120.13	112.60
1	A	168	ARG	NE-CZ-NH1	-7.22	114.28	121.50
1	D	131	ASP	CA-CB-CG	7.06	119.66	112.60
1	A	168	ARG	NE-CZ-NH2	7.06	125.55	119.20
1	B	166	ILE	N-CA-CB	7.06	118.34	110.51
1	A	108	ARG	CG-CD-NE	6.78	126.92	112.00
1	D	130	ASN	CA-CB-CG	6.72	119.32	112.60
1	C	45	GLN	OE1-CD-NE2	-6.52	116.08	122.60
1	B	178	ASP	CA-CB-CG	6.46	119.06	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	165	MET	CA-C-O	-6.25	113.84	121.28
1	D	96	ASP	CA-CB-CG	-6.23	106.37	112.60
1	B	92	VAL	CA-C-O	6.13	126.52	121.68
1	A	178	ASP	CA-CB-CG	6.12	118.72	112.60
1	D	178	ASP	CA-CB-CG	6.12	118.72	112.60
1	D	3	ASP	CA-CB-CG	6.10	118.70	112.60
1	A	102	GLN	OE1-CD-NE2	-5.91	116.69	122.60
1	B	161	ASP	N-CA-C	-5.82	106.14	113.18
1	D	46	ASP	CA-CB-CG	5.82	118.42	112.60
1	C	130	ASN	CA-CB-CG	5.74	118.34	112.60
1	A	96	ASP	CA-C-O	-5.52	114.10	119.51
1	B	155	GLU	CG-CD-OE1	5.45	130.94	118.40
1	C	1	ALA	CA-C-N	-5.37	114.64	120.71
1	C	1	ALA	C-N-CA	-5.37	114.64	120.71
1	C	102	GLN	CB-CG-CD	5.30	121.61	112.60
1	C	3	ASP	CA-CB-CG	5.23	117.83	112.60
1	A	45	GLN	CG-CD-NE2	5.11	124.07	116.40
1	A	69	MET	N-CA-CB	-5.08	102.64	110.16
1	C	108	ARG	NE-CZ-NH1	-5.02	116.48	121.50
1	A	114	GLN	CB-CG-CD	5.02	121.13	112.60
1	A	8	GLN	CG-CD-NE2	5.01	123.92	116.40

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	1390	0	1359	5	0
1	B	1386	0	1344	12	0
1	C	1390	0	1348	10	0
1	D	1382	0	1347	7	0
2	A	86	0	60	0	0
2	B	86	0	60	2	0
2	C	86	0	60	2	0
2	D	86	0	60	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	6	0	8	0	0
4	A	212	0	0	6	0
4	B	170	0	0	2	0
4	C	214	0	0	6	0
4	D	223	0	0	4	0
All	All	6717	0	5646	33	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 3.

All (33) 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:177:LYS:HD2	4:A:271:HOH:O	1.89	0.72
1:C:45:GLN:HG2	4:C:295:HOH:O	1.91	0.71
1:C:65[B]:GLU:HG2	2:C:199:HEC:HMD2	1.75	0.68
1:A:38:ARG:HG2	4:A:320:HOH:O	1.95	0.67
1:B:92:VAL:HG13	4:B:312:HOH:O	1.96	0.65
1:A:3:ASP:OD2	1:B:105:LYS:HE3	2.00	0.61
4:A:367:HOH:O	1:B:105:LYS:HD3	2.00	0.60
1:A:134:GLY:HA2	4:A:274:HOH:O	2.05	0.56
1:D:114:GLN:O	1:D:173:LYS:HE2	2.06	0.55
1:D:89:LYS:HE3	4:D:365:HOH:O	2.06	0.55
1:C:173:LYS:HE3	4:C:297:HOH:O	2.06	0.54
1:A:190:HIS:HE1	4:A:248:HOH:O	1.91	0.53
4:A:394:HOH:O	1:B:105:LYS:HD2	2.12	0.49
1:B:126:ASN:OD1	1:B:128:VAL:HG13	2.13	0.48
1:B:166:ILE:HG22	1:B:167:MET:N	2.27	0.48
1:B:130:ASN:HD22	1:B:130:ASN:C	2.22	0.48
1:B:92:VAL:HG22	4:B:312:HOH:O	2.14	0.47
1:C:102:GLN:NE2	4:C:312:HOH:O	2.48	0.47
1:D:188:GLY:O	1:D:190:HIS:ND1	2.49	0.46
1:D:108:ARG:NH2	4:D:403:HOH:O	2.47	0.45
1:C:137:LYS:NZ	4:C:381:HOH:O	2.50	0.45
1:B:167:MET:HG2	2:B:200:HEC:ND	2.32	0.44
1:B:121:GLY:C	1:D:69[B]:MET:HE2	2.43	0.44
1:C:62:LYS:NZ	4:C:335:HOH:O	2.51	0.43
1:D:173:LYS:NZ	4:D:417:HOH:O	2.50	0.43
1:B:162:GLY:O	1:B:168:ARG:NH2	2.50	0.43
1:C:45:GLN:NE2	4:C:325:HOH:O	2.49	0.43
1:D:108:ARG:HD3	4:D:401:HOH:O	2.19	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:65[B]:GLU:HG2	2:C:199:HEC:CMD	2.48	0.42
2:B:200:HEC:HMB3	2:B:200:HEC:HBB3	2.01	0.42
1:B:62:LYS:HE2	1:B:64:LEU:CD2	2.50	0.42
1:C:114:GLN:O	1:C:173:LYS:NZ	2.52	0.42
1:C:130:ASN:C	1:C:130:ASN:HD22	2.29	0.41

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	191/190 (100%)	186 (97%)	5 (3%)	0	100	100
1	B	190/190 (100%)	188 (99%)	2 (1%)	0	100	100
1	C	192/190 (101%)	187 (97%)	4 (2%)	1 (0%)	24	6
1	D	189/190 (100%)	187 (99%)	2 (1%)	0	100	100
All	All	762/760 (100%)	748 (98%)	13 (2%)	1 (0%)	48	17

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	124	ALA

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	141/138 (102%)	136 (96%)	5 (4%)	32	3
1	B	140/138 (101%)	134 (96%)	6 (4%)	26	2
1	C	142/138 (103%)	137 (96%)	5 (4%)	32	3
1	D	139/138 (101%)	136 (98%)	3 (2%)	45	10
All	All	562/552 (102%)	543 (97%)	19 (3%)	35	4

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	57	GLU
1	A	67[A]	THR
1	A	67[B]	THR
1	A	101	LYS
1	A	102	GLN
1	B	45	GLN
1	B	57	GLU
1	B	92	VAL
1	B	130	ASN
1	B	166	ILE
1	B	177	LYS
1	C	57	GLU
1	C	105	LYS
1	C	106	LEU
1	C	130	ASN
1	C	173	LYS
1	D	69[A]	MET
1	D	69[B]	MET
1	D	130	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	23	ASN
1	A	157	ASN
1	A	190	HIS
1	B	28	ASN
1	B	102	GLN
1	B	130	ASN
1	C	76	GLN
1	C	130	ASN
1	D	130	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

9 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	GOL	A	201	-	5,5,5	0.50	0	5,5,5	0.58	0
2	HEC	A	199	1	46,50,50	1.84	9 (19%)	58,82,82	1.68	5 (8%)
2	HEC	B	200	1	46,50,50	1.75	10 (21%)	58,82,82	1.62	8 (13%)
2	HEC	C	199	1	46,50,50	1.78	8 (17%)	58,82,82	1.73	5 (8%)
2	HEC	D	200	1	46,50,50	1.73	10 (21%)	58,82,82	1.64	8 (13%)
2	HEC	B	199	1	46,50,50	1.83	9 (19%)	58,82,82	1.82	8 (13%)
2	HEC	D	199	1	46,50,50	1.85	7 (15%)	58,82,82	1.78	7 (12%)
2	HEC	C	200	1	46,50,50	1.77	10 (21%)	58,82,82	1.73	8 (13%)
2	HEC	A	200	1	46,50,50	1.82	10 (21%)	58,82,82	1.80	12 (20%)

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
3	GOL	A	201	-	-	0/4/4/4	-
2	HEC	A	199	1	-	6/14/54/54	-
2	HEC	B	200	1	-	6/14/54/54	-
2	HEC	C	199	1	-	7/14/54/54	-
2	HEC	D	200	1	-	6/14/54/54	-
2	HEC	B	199	1	-	6/14/54/54	-
2	HEC	D	199	1	-	6/14/54/54	-
2	HEC	C	200	1	-	6/14/54/54	-
2	HEC	A	200	1	-	5/14/54/54	-

All (73) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	200	HEC	O1D-CGD	6.19	1.42	1.22
2	A	199	HEC	O2D-CGD	-6.07	1.10	1.30
2	B	199	HEC	O2D-CGD	-6.01	1.10	1.30
2	D	199	HEC	O2D-CGD	-5.91	1.11	1.30
2	C	199	HEC	O2D-CGD	-5.42	1.12	1.30
2	B	200	HEC	O1D-CGD	5.24	1.39	1.22
2	A	199	HEC	CAB-C3B	5.21	1.51	1.35
2	D	199	HEC	CAB-C3B	5.09	1.51	1.35
2	D	200	HEC	O1D-CGD	5.08	1.38	1.22
2	A	200	HEC	CAC-C3C	5.08	1.51	1.35
2	D	200	HEC	CAC-C3C	4.95	1.51	1.35
2	C	200	HEC	O1D-CGD	4.92	1.38	1.22
2	C	199	HEC	CAB-C3B	4.84	1.50	1.35
2	C	200	HEC	CAC-C3C	4.84	1.50	1.35
2	B	199	HEC	CAB-C3B	4.77	1.50	1.35
2	B	200	HEC	CAC-C3C	4.77	1.50	1.35
2	D	199	HEC	CAC-C3C	4.25	1.48	1.35
2	C	199	HEC	CAC-C3C	4.11	1.48	1.35
2	C	200	HEC	CAB-C3B	4.08	1.48	1.35
2	B	200	HEC	CAB-C3B	3.99	1.48	1.35
2	B	199	HEC	CAC-C3C	3.98	1.47	1.35
2	D	200	HEC	CAB-C3B	3.87	1.47	1.35
2	A	199	HEC	CAC-C3C	3.80	1.47	1.35
2	A	200	HEC	CAB-C3B	3.77	1.47	1.35
2	D	199	HEC	CBD-CGD	3.72	1.59	1.50
2	B	199	HEC	CBD-CGD	3.26	1.58	1.50
2	C	200	HEC	O2D-CGD	-3.10	1.20	1.30
2	A	199	HEC	CBD-CGD	3.02	1.57	1.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	200	HEC	O2D-CGD	-2.94	1.21	1.30
2	A	199	HEC	C4D-C3D	-2.88	1.38	1.44
2	C	199	HEC	CBD-CGD	2.85	1.57	1.50
2	D	200	HEC	CMB-C2B	-2.71	1.45	1.50
2	A	200	HEC	CBD-CGD	2.68	1.56	1.50
2	B	200	HEC	C3C-C4C	-2.68	1.41	1.46
2	C	200	HEC	O2A-CGA	-2.66	1.22	1.30
2	D	199	HEC	C4D-C3D	-2.65	1.39	1.44
2	C	199	HEC	C4D-C3D	-2.65	1.39	1.44
2	A	199	HEC	O2A-CGA	-2.62	1.22	1.30
2	B	200	HEC	O2A-CGA	-2.59	1.22	1.30
2	B	200	HEC	O2D-CGD	-2.58	1.22	1.30
2	B	199	HEC	C4D-C3D	-2.58	1.39	1.44
2	A	200	HEC	CMB-C2B	-2.57	1.45	1.50
2	D	199	HEC	O2A-CGA	-2.57	1.22	1.30
2	C	200	HEC	CBD-CGD	2.56	1.56	1.50
2	C	199	HEC	C1B-C2B	2.54	1.49	1.43
2	B	199	HEC	C1B-C2B	2.49	1.49	1.43
2	C	199	HEC	O2A-CGA	-2.43	1.22	1.30
2	B	199	HEC	CBB-CAB	2.43	1.58	1.49
2	A	199	HEC	C4D-ND	2.43	1.44	1.39
2	B	200	HEC	CMD-C2D	2.38	1.55	1.50
2	A	200	HEC	C1B-C2B	2.37	1.48	1.43
2	A	200	HEC	CMD-C2D	2.36	1.55	1.50
2	A	199	HEC	C1B-C2B	2.35	1.48	1.43
2	D	200	HEC	CBD-CGD	2.33	1.56	1.50
2	B	200	HEC	CMB-C2B	-2.29	1.46	1.50
2	B	199	HEC	O2A-CGA	-2.26	1.23	1.30
2	C	200	HEC	CMB-C2B	-2.26	1.46	1.50
2	B	200	HEC	C1B-C2B	2.26	1.48	1.43
2	A	200	HEC	C3C-C4C	-2.23	1.42	1.46
2	A	199	HEC	O1A-CGA	2.22	1.29	1.22
2	B	200	HEC	CBD-CGD	2.21	1.55	1.50
2	D	199	HEC	C1B-C2B	2.21	1.48	1.43
2	C	199	HEC	C4D-ND	2.20	1.43	1.39
2	A	200	HEC	O2A-CGA	-2.18	1.23	1.30
2	C	200	HEC	CMD-C2D	2.18	1.55	1.50
2	B	199	HEC	O1A-CGA	2.16	1.29	1.22
2	D	200	HEC	O2A-CGA	-2.14	1.23	1.30
2	C	200	HEC	C3C-C4C	-2.13	1.42	1.46
2	A	200	HEC	O2D-CGD	-2.13	1.23	1.30
2	C	200	HEC	O1A-CGA	2.11	1.29	1.22

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	200	HEC	CMD-C2D	2.11	1.55	1.50
2	D	200	HEC	C3C-C4C	-2.10	1.42	1.46
2	D	200	HEC	C1B-C2B	2.02	1.47	1.43

All (61) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	199	HEC	CBB-CAB-C3B	-8.26	110.92	127.43
2	D	199	HEC	CBB-CAB-C3B	-7.97	111.50	127.43
2	A	199	HEC	CBB-CAB-C3B	-7.89	111.67	127.43
2	C	199	HEC	CBB-CAB-C3B	-7.83	111.78	127.43
2	C	200	HEC	CBB-CAB-C3B	-7.55	112.35	127.43
2	D	199	HEC	CBC-CAC-C3C	-7.15	113.14	127.43
2	D	200	HEC	CBB-CAB-C3B	-7.07	113.31	127.43
2	C	199	HEC	CBC-CAC-C3C	-6.95	113.54	127.43
2	B	200	HEC	CBB-CAB-C3B	-6.90	113.65	127.43
2	A	200	HEC	CBC-CAC-C3C	-6.75	113.94	127.43
2	A	200	HEC	CBB-CAB-C3B	-6.67	114.10	127.43
2	B	199	HEC	CBC-CAC-C3C	-6.44	114.56	127.43
2	A	199	HEC	CBC-CAC-C3C	-6.22	115.01	127.43
2	B	200	HEC	CBC-CAC-C3C	-6.19	115.06	127.43
2	C	200	HEC	CBC-CAC-C3C	-5.88	115.67	127.43
2	D	200	HEC	CBC-CAC-C3C	-5.58	116.27	127.43
2	D	200	HEC	O2D-CGD-CBD	3.18	124.05	114.00
2	D	199	HEC	O1A-CGA-CBA	-3.17	113.05	123.09
2	C	200	HEC	O1A-CGA-CBA	-3.12	113.19	123.09
2	D	200	HEC	O1A-CGA-CBA	-3.04	113.46	123.09
2	A	200	HEC	O2D-CGD-CBD	3.03	123.58	114.00
2	A	200	HEC	CBD-CAD-C3D	2.94	120.65	112.53
2	B	200	HEC	O2D-CGD-CBD	2.93	123.24	114.00
2	D	200	HEC	O2A-CGA-CBA	2.88	123.09	114.00
2	C	200	HEC	O2A-CGA-CBA	2.83	122.94	114.00
2	A	200	HEC	O1A-CGA-CBA	-2.81	114.18	123.09
2	B	200	HEC	O1A-CGA-CBA	-2.80	114.22	123.09
2	A	200	HEC	O1D-CGD-CBD	-2.79	114.25	123.09
2	C	200	HEC	O2D-CGD-CBD	2.74	122.65	114.00
2	A	200	HEC	O2A-CGA-CBA	2.74	122.65	114.00
2	A	199	HEC	O1A-CGA-CBA	-2.71	114.49	123.09
2	C	199	HEC	O1A-CGA-CBA	-2.69	114.57	123.09
2	B	200	HEC	O2A-CGA-CBA	2.57	122.11	114.00
2	B	199	HEC	CHC-C4B-NB	-2.56	121.66	124.45
2	D	200	HEC	O1D-CGD-CBD	-2.51	115.12	123.09

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	199	HEC	C4D-ND-C1D	-2.44	101.84	105.82
2	C	200	HEC	O1D-CGD-CBD	-2.44	115.37	123.09
2	A	200	HEC	O2D-CGD-O1D	-2.43	117.08	123.33
2	B	199	HEC	C1D-C2D-C3D	-2.42	104.04	106.82
2	B	199	HEC	O1A-CGA-CBA	-2.41	115.44	123.09
2	C	200	HEC	C2A-C1A-NA	-2.41	108.00	110.32
2	B	200	HEC	O1D-CGD-CBD	-2.37	115.57	123.09
2	A	200	HEC	CHC-C4B-NB	-2.34	121.91	124.45
2	D	200	HEC	C2A-C1A-NA	-2.33	108.08	110.32
2	A	199	HEC	O2A-CGA-CBA	2.29	121.24	114.00
2	A	200	HEC	C3D-C4D-ND	2.29	112.69	110.15
2	A	200	HEC	CMB-C2B-C3B	2.28	131.91	126.55
2	D	199	HEC	CBD-CAD-C3D	2.23	118.71	112.53
2	B	199	HEC	CMB-C2B-C3B	2.20	131.73	126.55
2	C	199	HEC	CHC-C4B-NB	-2.20	122.06	124.45
2	A	200	HEC	C2A-C1A-NA	-2.18	108.22	110.32
2	B	200	HEC	C3D-C4D-ND	2.15	112.53	110.15
2	D	199	HEC	O2A-CGA-CBA	2.13	120.74	114.00
2	B	199	HEC	O2A-CGA-CBA	2.13	120.74	114.00
2	C	200	HEC	C3D-C4D-ND	2.09	112.47	110.15
2	C	199	HEC	O2A-CGA-CBA	2.05	120.47	114.00
2	D	199	HEC	CHC-C4B-NB	-2.03	122.24	124.45
2	B	200	HEC	CMB-C2B-C3B	2.03	131.33	126.55
2	D	200	HEC	CAD-CBD-CGD	-2.02	108.30	113.67
2	A	199	HEC	CMB-C2B-C3B	2.01	131.28	126.55
2	D	199	HEC	CAD-CBD-CGD	-2.01	108.34	113.67

There are no chirality outliers.

All (48) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	199	HEC	C2B-C3B-CAB-CBB
2	A	199	HEC	C4B-C3B-CAB-CBB
2	A	199	HEC	C2C-C3C-CAC-CBC
2	A	199	HEC	C4C-C3C-CAC-CBC
2	A	200	HEC	C2B-C3B-CAB-CBB
2	A	200	HEC	C4B-C3B-CAB-CBB
2	A	200	HEC	C2C-C3C-CAC-CBC
2	A	200	HEC	C4C-C3C-CAC-CBC
2	B	199	HEC	C2B-C3B-CAB-CBB
2	B	199	HEC	C4B-C3B-CAB-CBB
2	B	199	HEC	C2C-C3C-CAC-CBC

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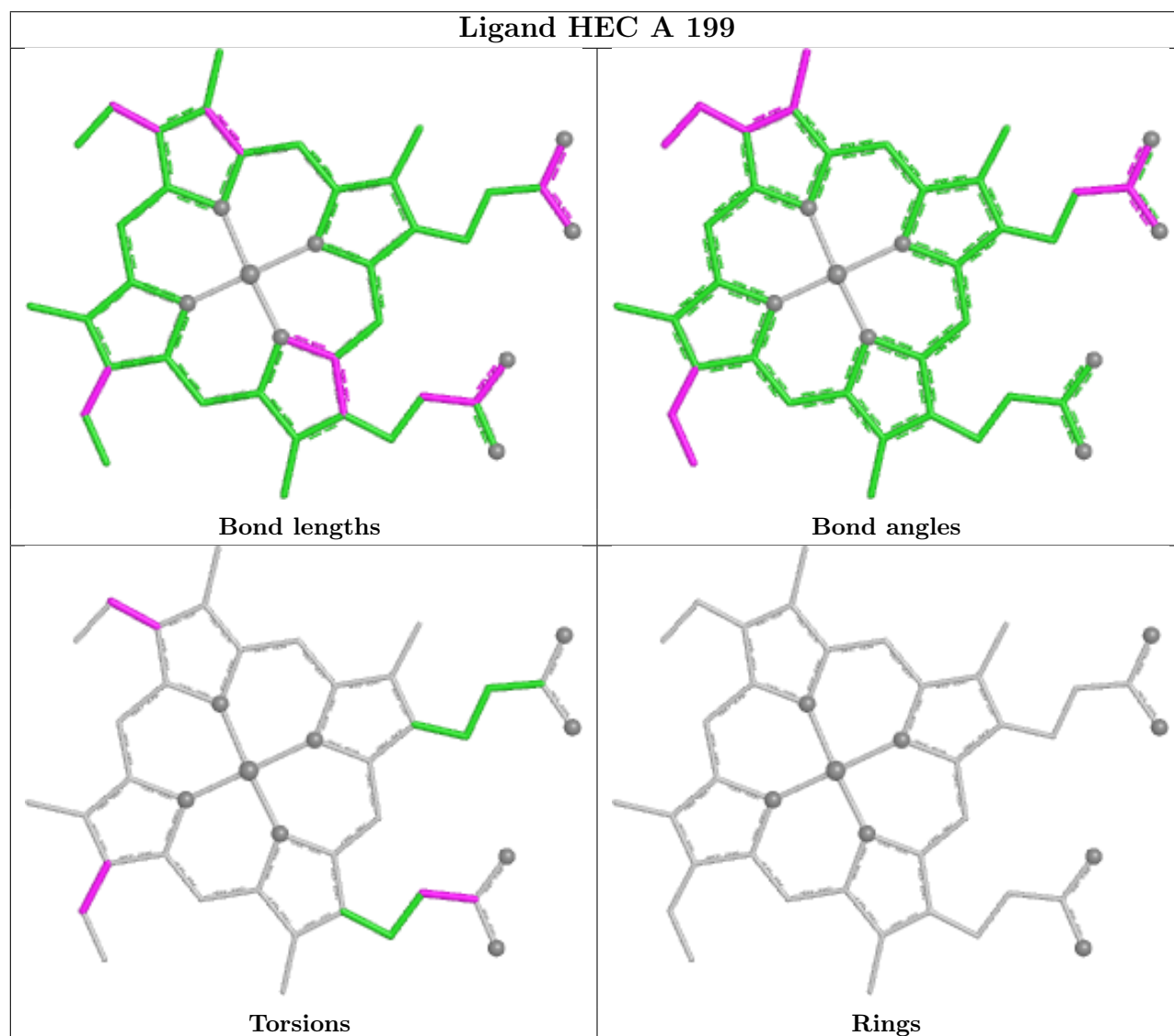
Mol	Chain	Res	Type	Atoms
2	B	199	HEC	C4C-C3C-CAC-CBC
2	B	200	HEC	C2B-C3B-CAB-CBB
2	B	200	HEC	C4B-C3B-CAB-CBB
2	B	200	HEC	C2C-C3C-CAC-CBC
2	B	200	HEC	C4C-C3C-CAC-CBC
2	C	199	HEC	C2B-C3B-CAB-CBB
2	C	199	HEC	C4B-C3B-CAB-CBB
2	C	199	HEC	C2C-C3C-CAC-CBC
2	C	199	HEC	C4C-C3C-CAC-CBC
2	C	200	HEC	C2B-C3B-CAB-CBB
2	C	200	HEC	C4B-C3B-CAB-CBB
2	C	200	HEC	C2C-C3C-CAC-CBC
2	C	200	HEC	C4C-C3C-CAC-CBC
2	D	199	HEC	C2B-C3B-CAB-CBB
2	D	199	HEC	C4B-C3B-CAB-CBB
2	D	199	HEC	C2C-C3C-CAC-CBC
2	D	199	HEC	C4C-C3C-CAC-CBC
2	D	200	HEC	C2B-C3B-CAB-CBB
2	D	200	HEC	C4B-C3B-CAB-CBB
2	D	200	HEC	C2C-C3C-CAC-CBC
2	D	200	HEC	C4C-C3C-CAC-CBC
2	C	200	HEC	CAD-CBD-CGD-O1D
2	D	200	HEC	CAD-CBD-CGD-O1D
2	D	199	HEC	CAD-CBD-CGD-O2D
2	B	200	HEC	CAD-CBD-CGD-O2D
2	D	199	HEC	CAD-CBD-CGD-O1D
2	D	200	HEC	CAD-CBD-CGD-O2D
2	A	199	HEC	CAD-CBD-CGD-O1D
2	C	200	HEC	CAD-CBD-CGD-O2D
2	C	199	HEC	CAD-CBD-CGD-O1D
2	B	199	HEC	CAD-CBD-CGD-O2D
2	A	199	HEC	CAD-CBD-CGD-O2D
2	A	200	HEC	CAD-CBD-CGD-O1D
2	B	199	HEC	CAD-CBD-CGD-O1D
2	B	200	HEC	CAD-CBD-CGD-O1D
2	C	199	HEC	CAD-CBD-CGD-O2D
2	C	199	HEC	CAA-CBA-CGA-O2A

There are no ring outliers.

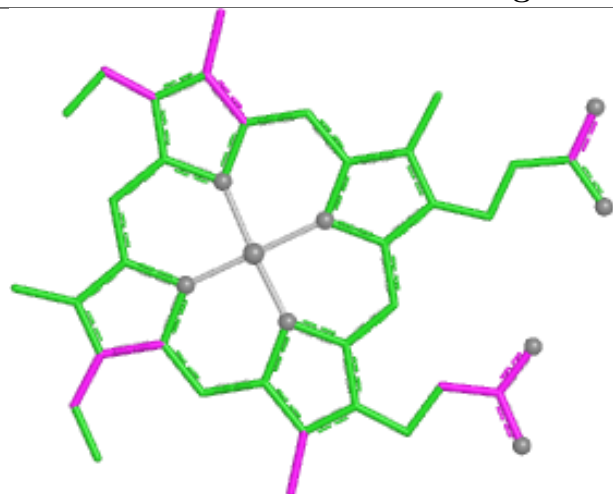
2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	200	HEC	2	0
2	C	199	HEC	2	0

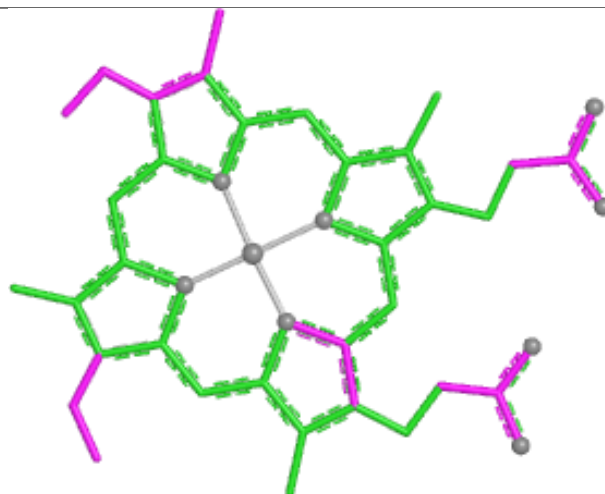
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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



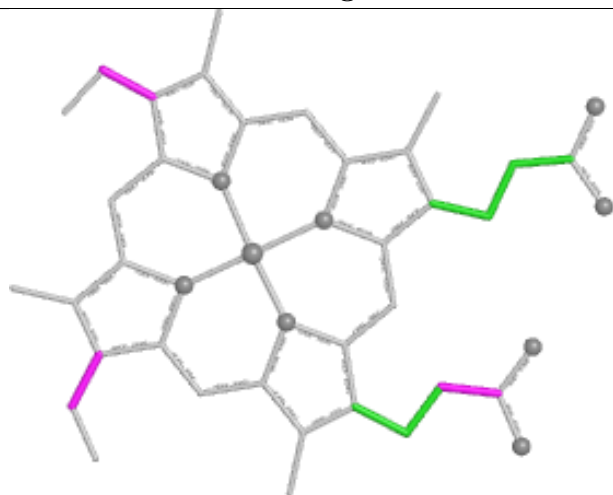
Ligand HEC B 200



Bond lengths



Bond angles

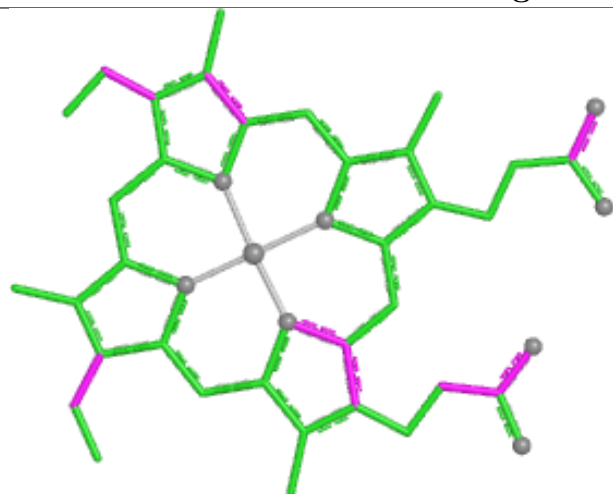


Torsions

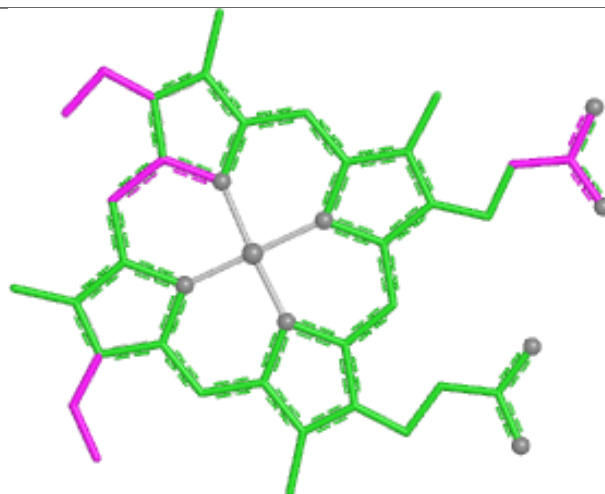


Rings

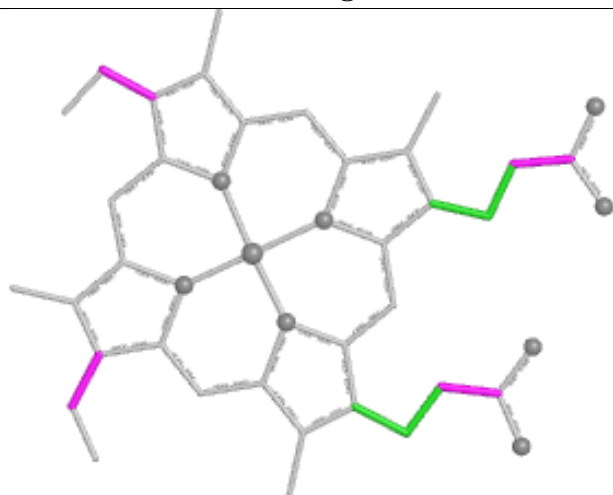
Ligand HEC C 199



Bond lengths



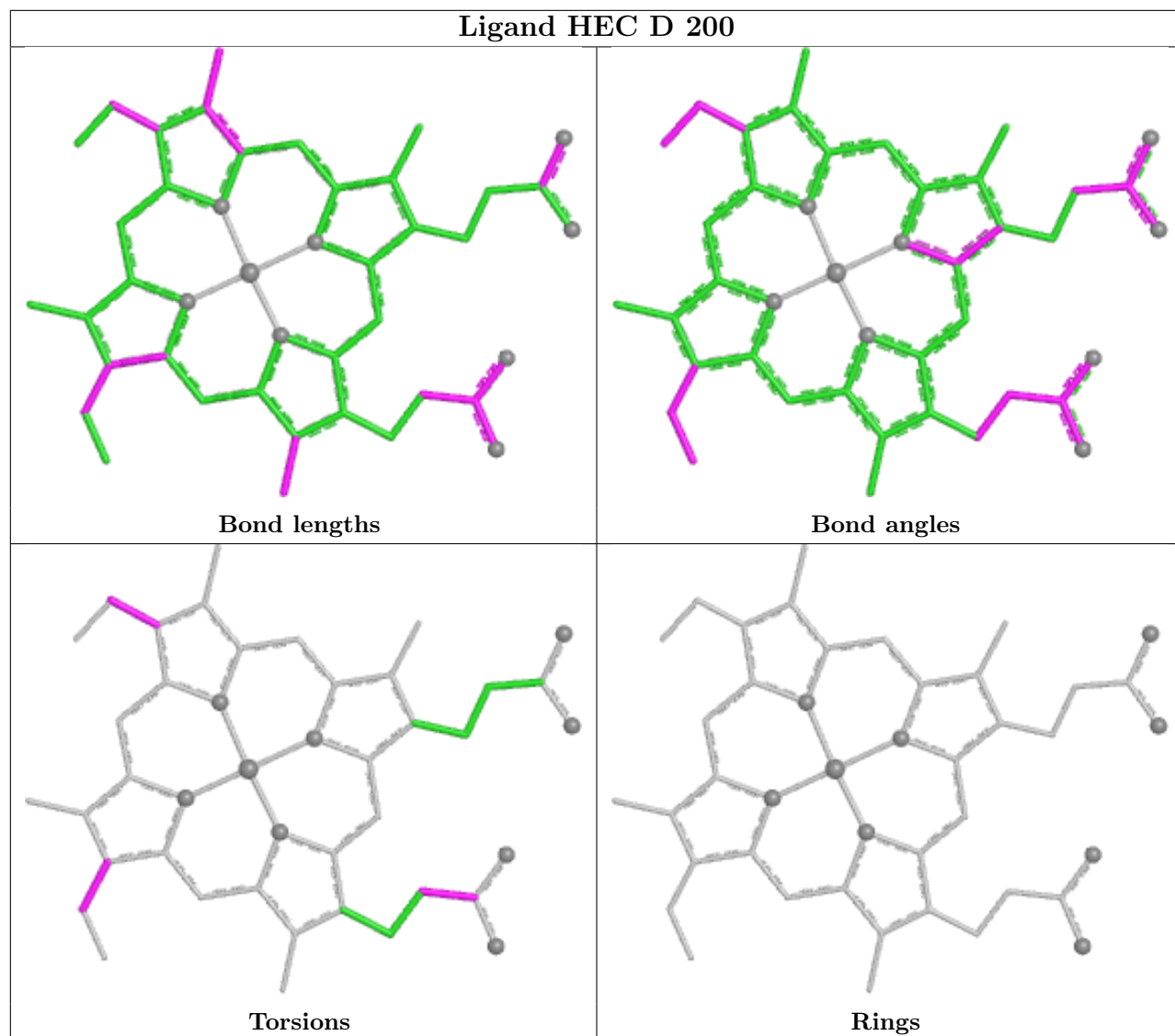
Bond angles



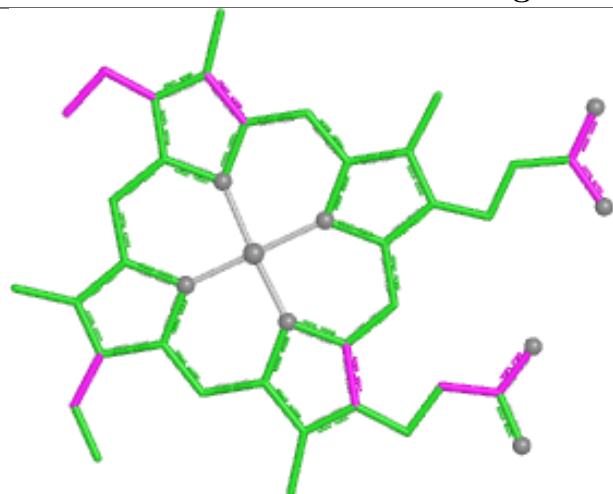
Torsions



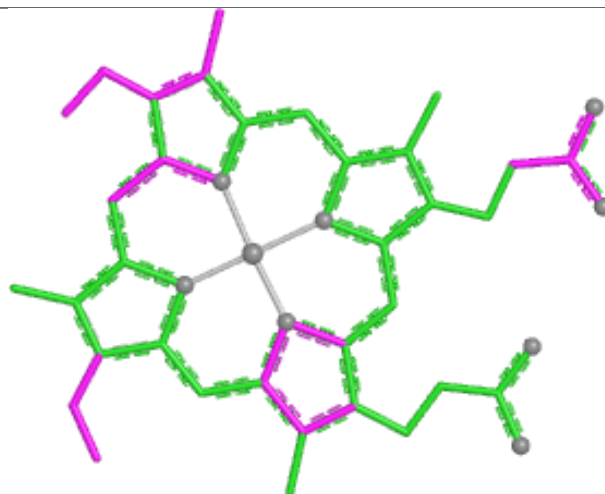
Rings



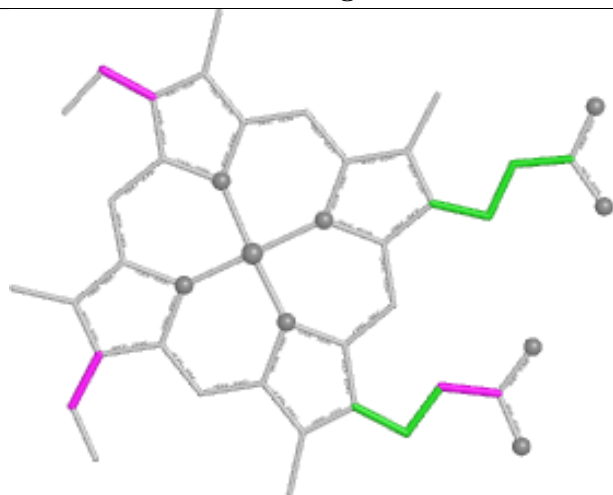
Ligand HEC B 199



Bond lengths



Bond angles

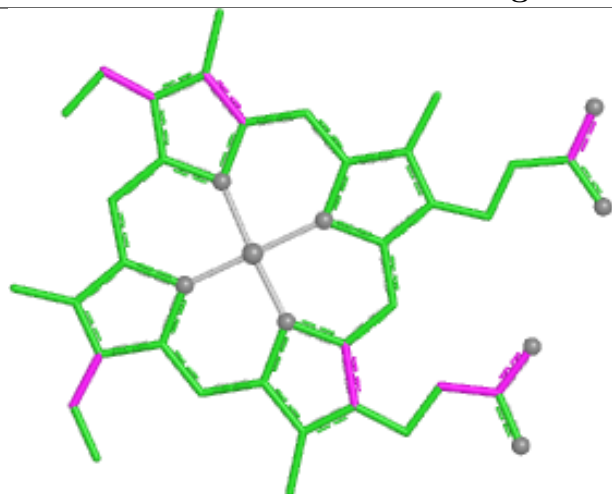


Torsions

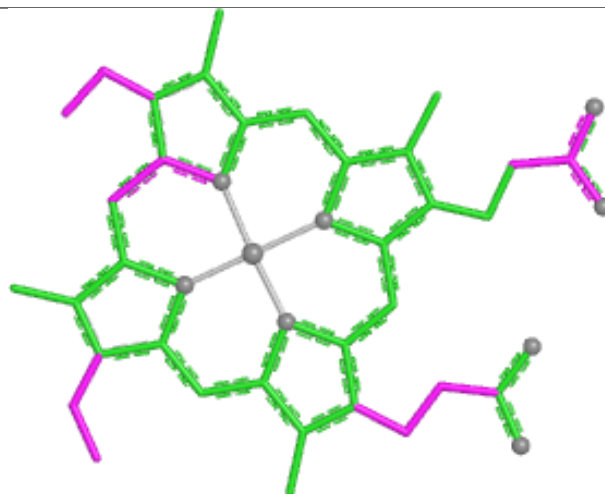


Rings

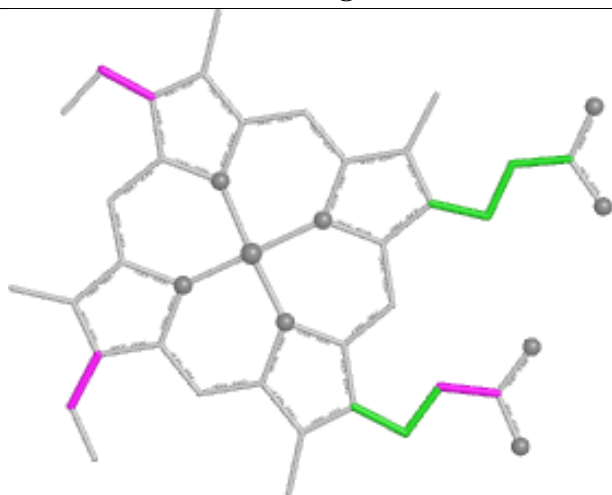
Ligand HEC D 199



Bond lengths



Bond angles

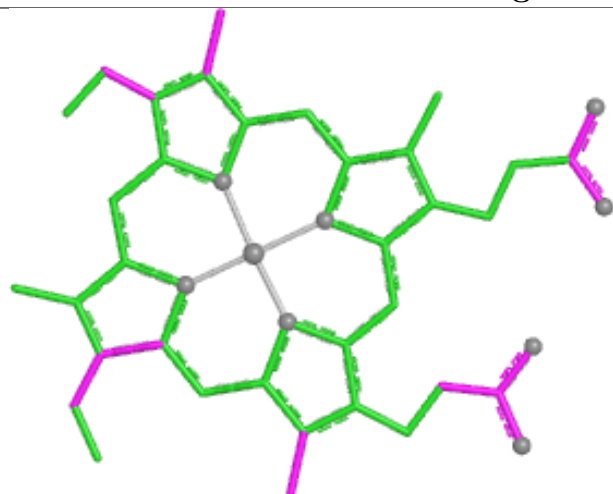


Torsions

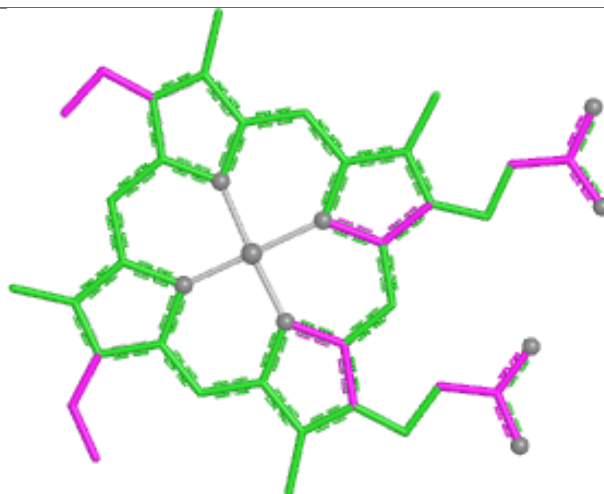


Rings

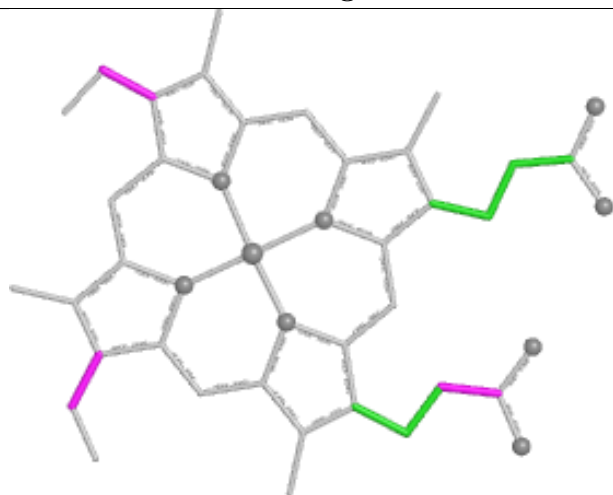
Ligand HEC C 200



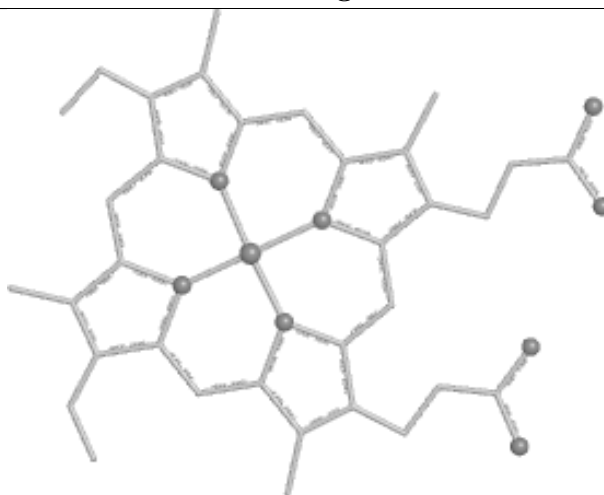
Bond lengths



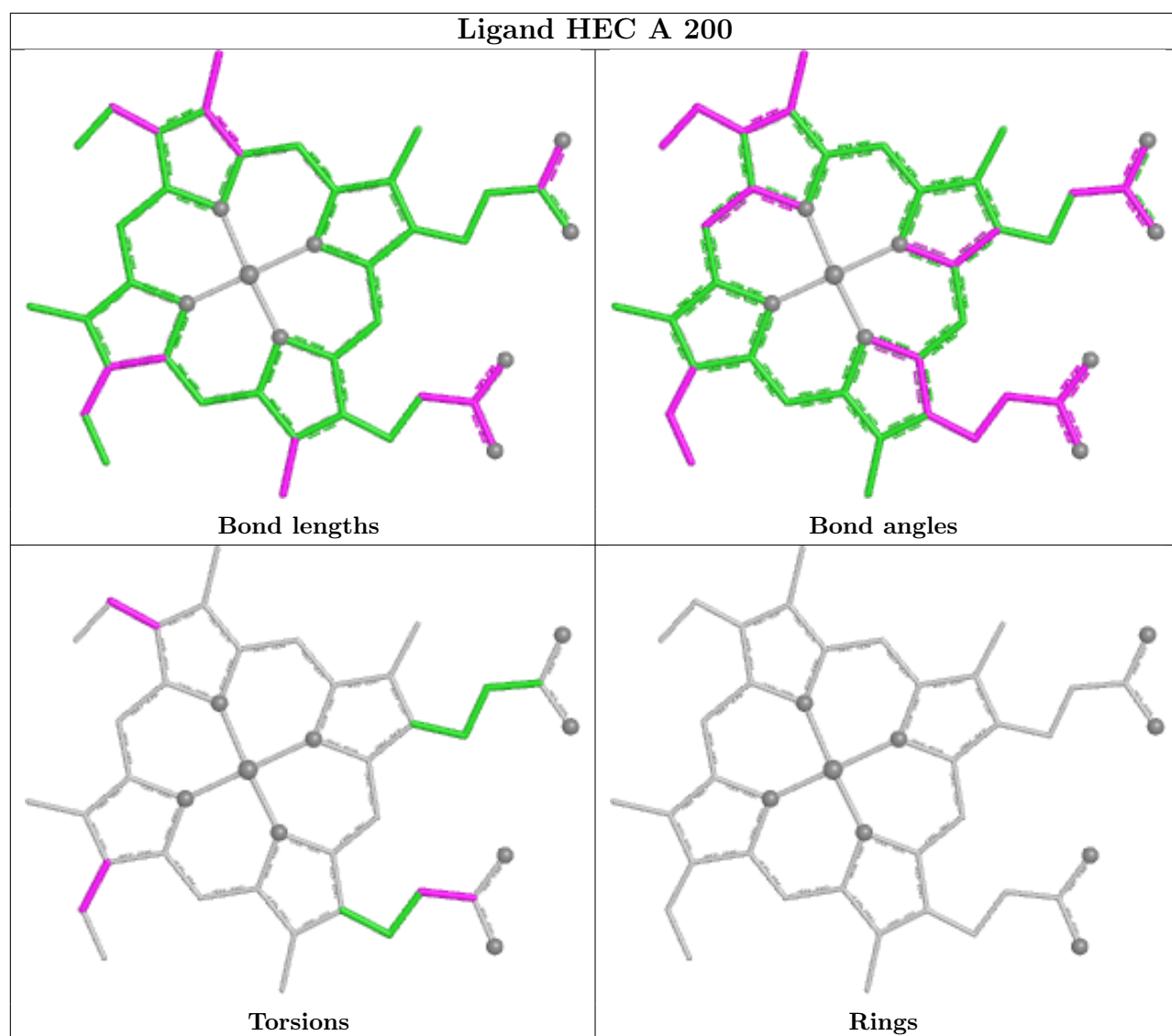
Bond angles



Torsions



Rings



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, 95th 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	190/190 (100%)	0.31	5 (2%) 57 59	12, 17, 31, 52	3 (1%)
1	B	190/190 (100%)	0.64	9 (4%) 36 38	13, 20, 34, 53	2 (1%)
1	C	190/190 (100%)	0.35	7 (3%) 45 47	12, 17, 31, 55	4 (2%)
1	D	190/190 (100%)	0.38	7 (3%) 45 47	12, 17, 31, 52	1 (0%)
All	All	760/760 (100%)	0.42	28 (3%) 45 47	12, 18, 32, 55	10 (1%)

All (28) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	162	GLY	7.1
1	D	94	TYR	6.0
1	B	164	THR	5.4
1	B	163	ASP	5.2
1	B	92	VAL	4.1
1	D	132	LEU	3.8
1	C	1	ALA	3.6
1	B	166	ILE	3.5
1	B	1	ALA	3.4
1	B	165	MET	3.2
1	A	163	ASP	3.1
1	C	94	TYR	3.0
1	C	26	ALA	2.9
1	D	59	VAL	2.6
1	A	135	PHE	2.6
1	A	164	THR	2.5
1	C	132	LEU	2.5
1	B	94	TYR	2.5
1	A	133	ALA	2.4
1	D	92	VAL	2.3
1	D	54	GLY	2.3

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Mol	Chain	Res	Type	RSRZ
1	D	95	ALA	2.2
1	D	58	GLY	2.1
1	B	64	LEU	2.1
1	C	172	ALA	2.1
1	A	94	TYR	2.1
1	C	173	LYS	2.1
1	C	95	ALA	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

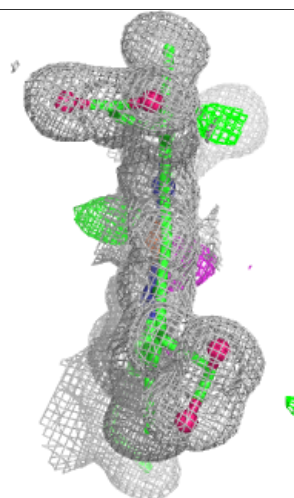
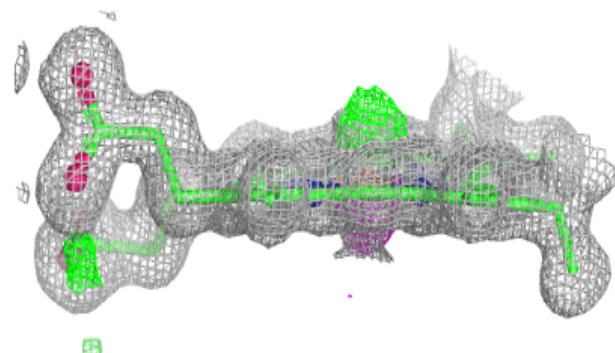
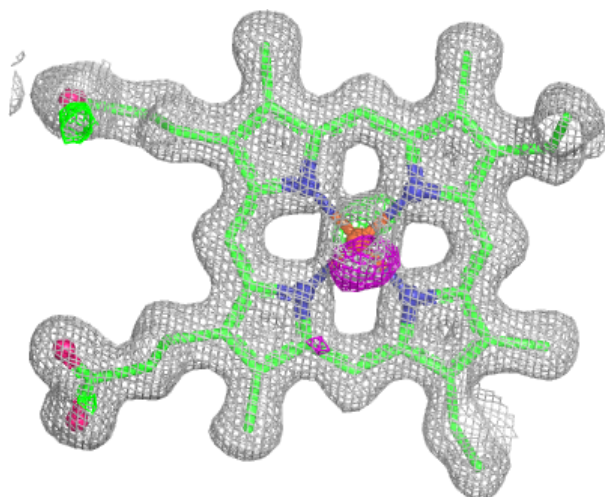
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	GOL	A	201	6/6	0.96	0.07	18,19,21,22	0
2	HEC	B	199	43/43	0.98	0.06	12,14,17,29	0
2	HEC	A	200	43/43	0.98	0.06	11,12,20,27	0
2	HEC	B	200	43/43	0.99	0.06	11,13,17,20	0
2	HEC	C	199	43/43	0.99	0.05	11,12,15,26	0
2	HEC	C	200	43/43	0.99	0.05	10,12,15,18	0
2	HEC	D	199	43/43	0.99	0.06	11,12,15,22	0
2	HEC	D	200	43/43	0.99	0.05	11,12,15,18	0
2	HEC	A	199	43/43	0.99	0.05	11,13,17,37	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.

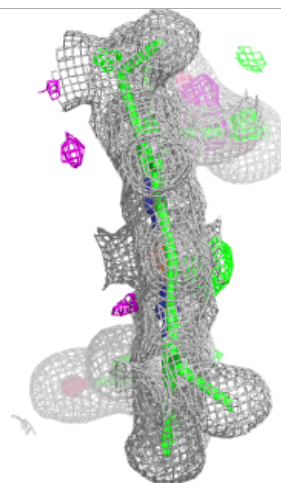
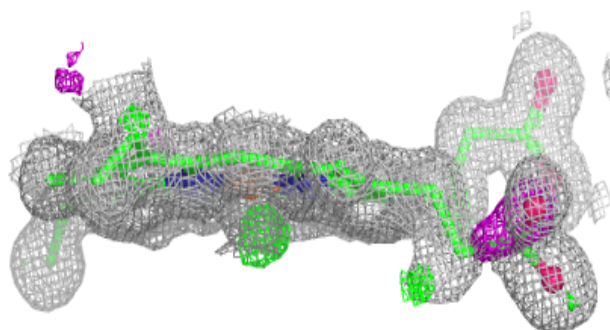
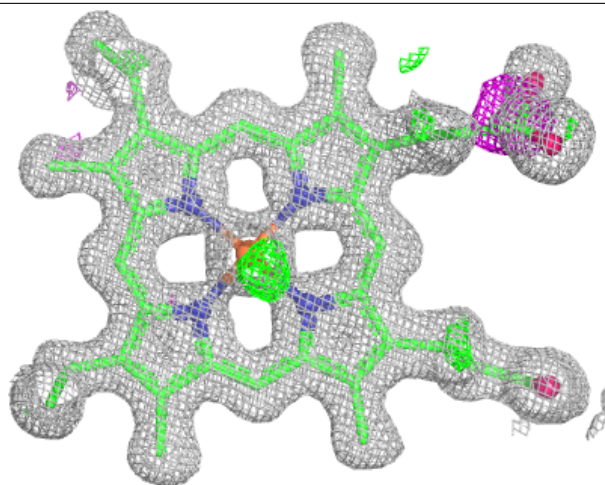
Electron density around HEC B 199:

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



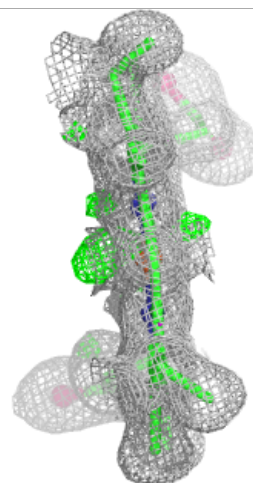
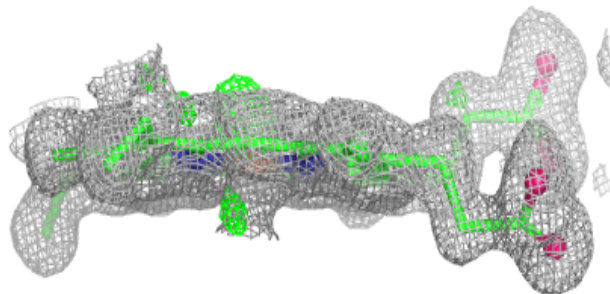
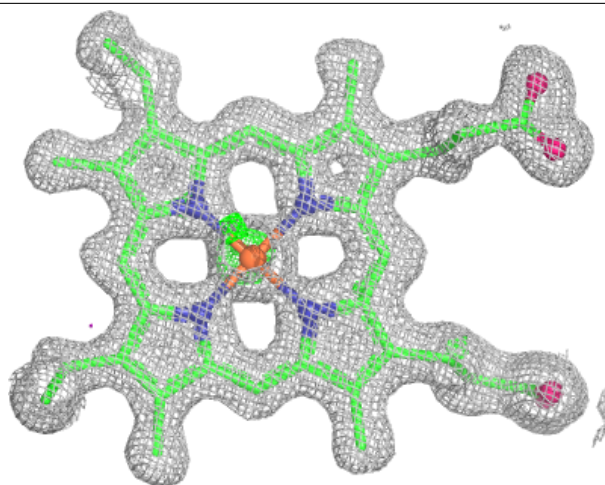
Electron density around HEC A 200:

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



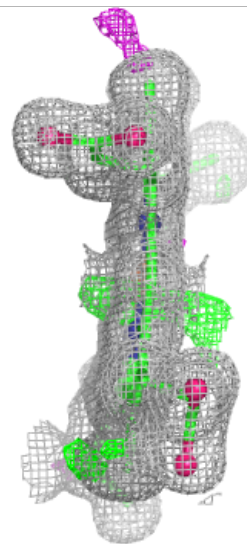
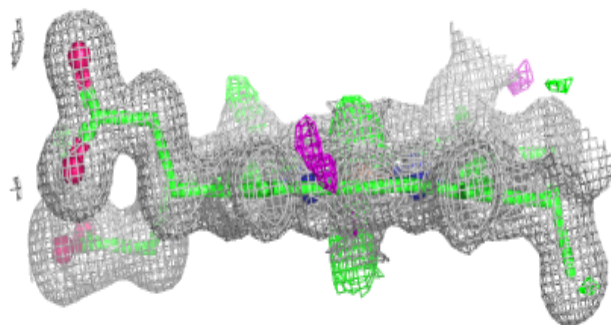
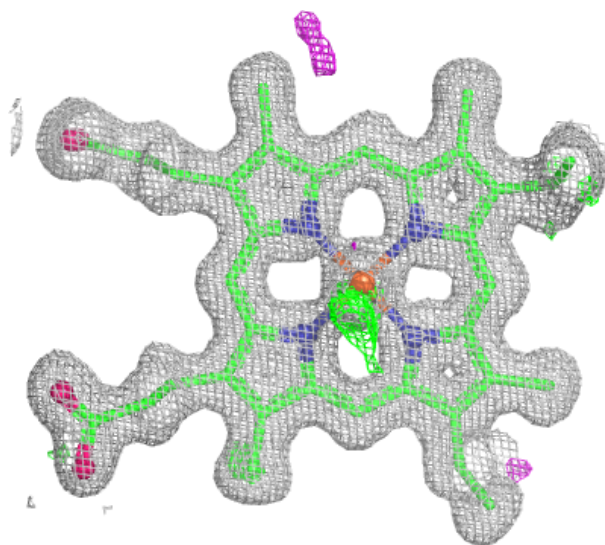
Electron density around HEC B 200:

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



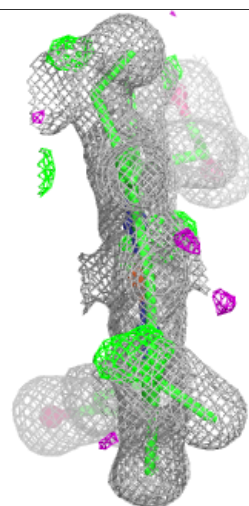
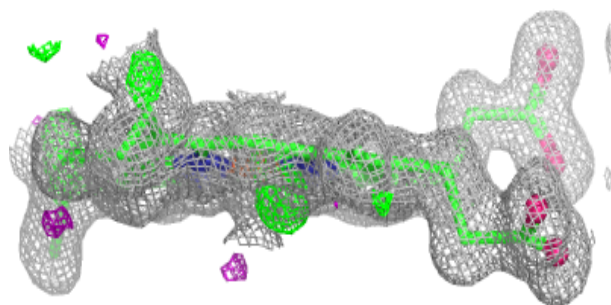
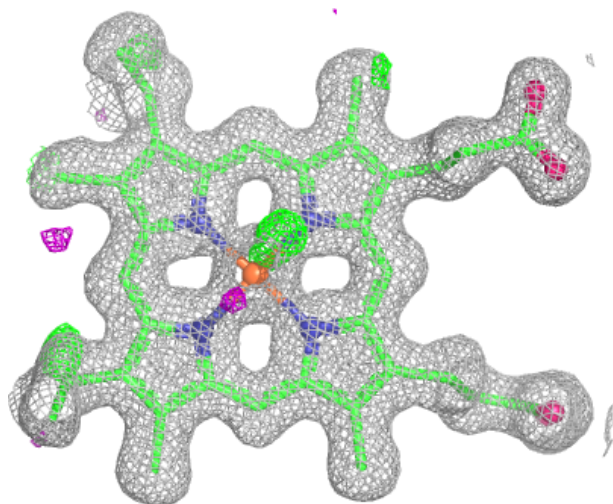
Electron density around HEC C 199:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



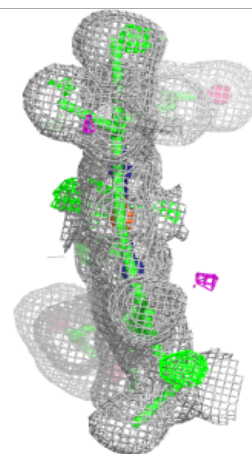
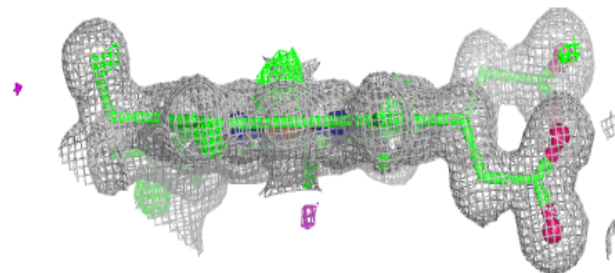
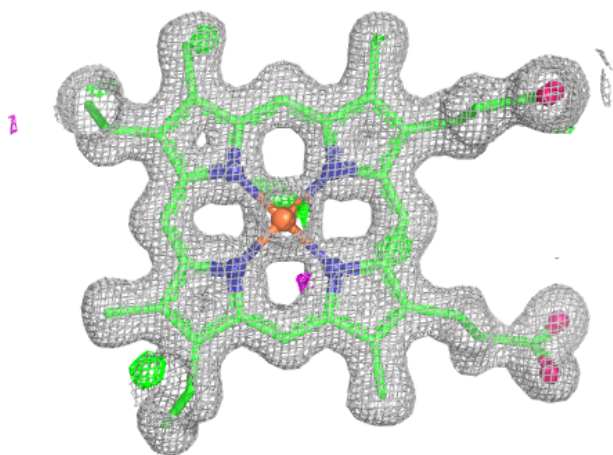
Electron density around HEC C 200:

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



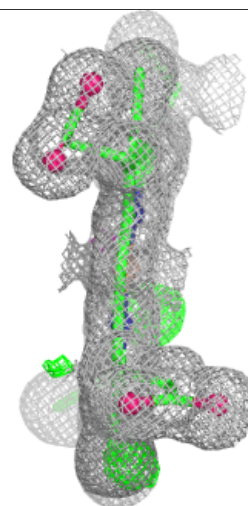
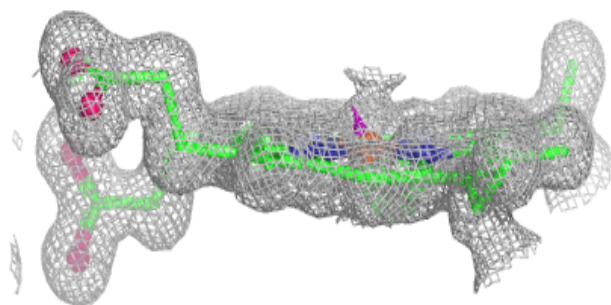
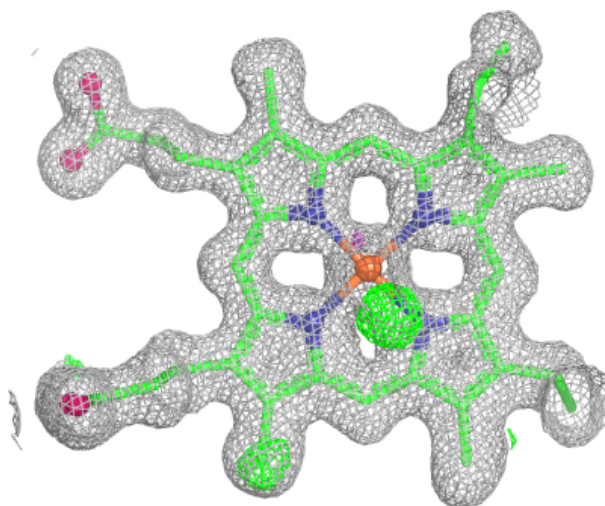
Electron density around HEC D 199:

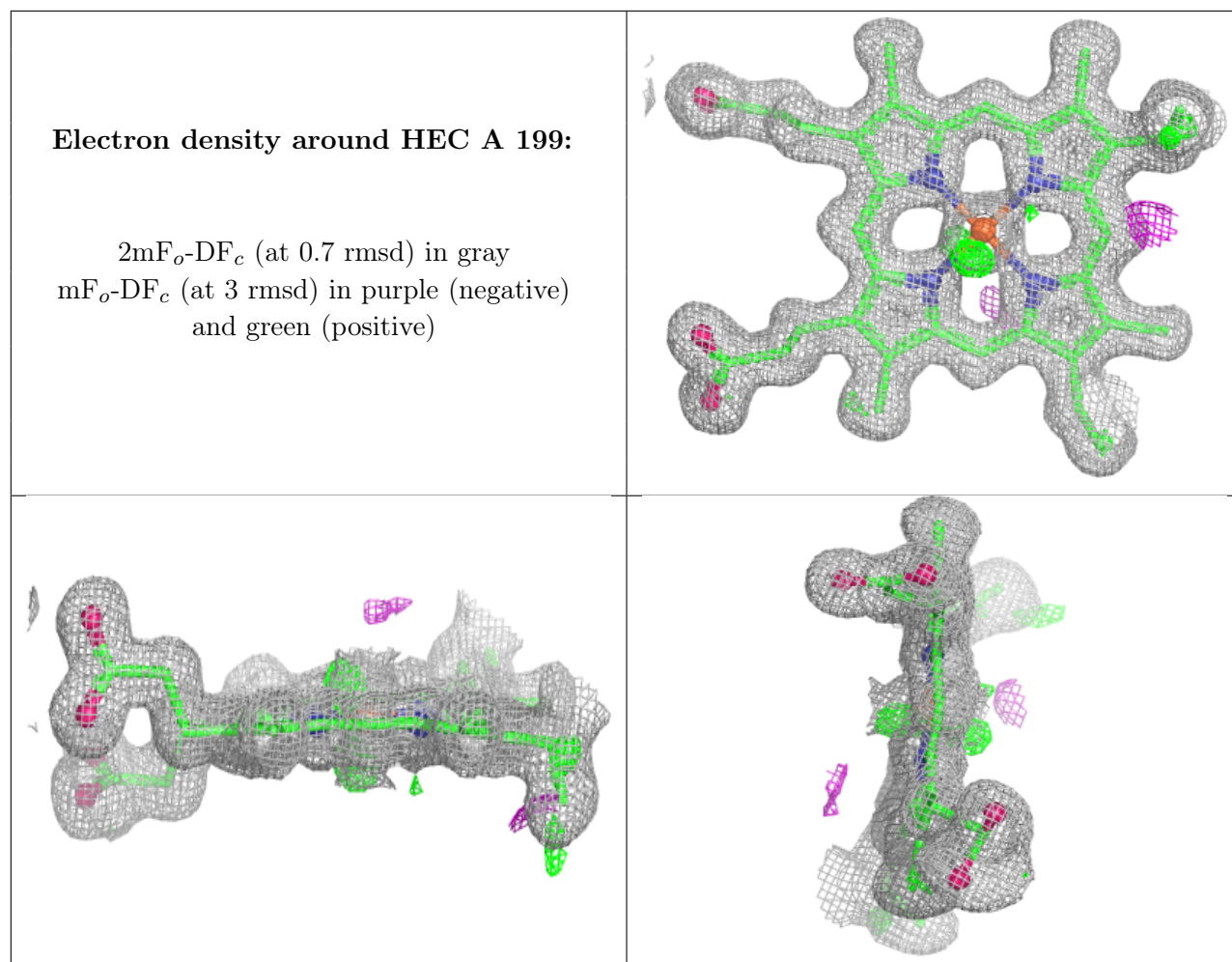
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around HEC D 200:

$2mF_o-DF_c$ (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.