Full wwPDB X-ray Structure Validation Report (i)

Dec 17, 2023 – 02:25 PM EST

PDB ID	:	1QGI
Title	:	CHITOSANASE FROM BACILLUS CIRCULANS
Authors	:	Saito, J.; Kita, A.; Higuchi, Y.; Nagata, Y.; Ando, A.; Miki, K.
Deposited on	:	1999-04-28
Resolution	:	1.60 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 (i) 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 (i)) were used in the production of this report:

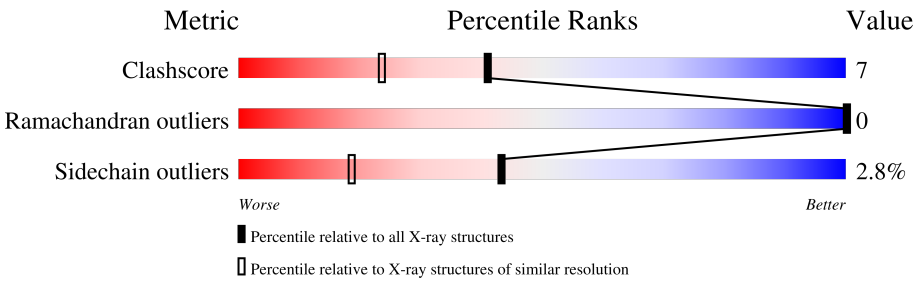
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 1.60 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))
Clashscore	141614	3665 (1.60-1.60)
Ramachandran outliers	138981	3564 (1.60-1.60)
Sidechain outliers	138945	3563 (1.60-1.60)

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%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	259	87% 12% •
2	B	3	100%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 2226 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.

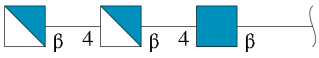
- Molecule 1 is a protein called PROTEIN (CHITOSANASE).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	259	2037	1272	356	400	9	0	0	0

There are 9 discrepancies between the modelled and reference sequences:

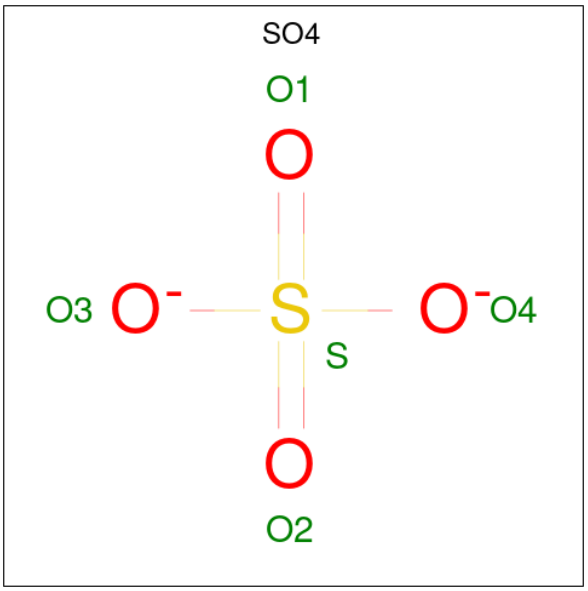
Chain	Residue	Modelled	Actual	Comment	Reference
A	77	ASP	ARG	cloning artifact	UNP P33673
A	78	GLY	TRP	cloning artifact	UNP P33673
A	80	ASP	GLY	cloning artifact	UNP P33673
A	?	-	PRO	deletion	UNP P33673
A	82	PHE	SER	cloning artifact	UNP P33673
A	98	GLY	ASP	cloning artifact	UNP P33673
A	158	GLN	HIS	cloning artifact	UNP P33673
A	159	ARG	-	insertion	UNP P33673
A	160	GLY	ALA	cloning artifact	UNP P33673

- Molecule 2 is an oligosaccharide called 2-amino-2-deoxy-beta-D-glucopyranose-(1-4)-2-amino-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	B	3	36	20	3	13	0	0	0

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	S		
3	A	1	3	2	1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	150	150	150	0	0

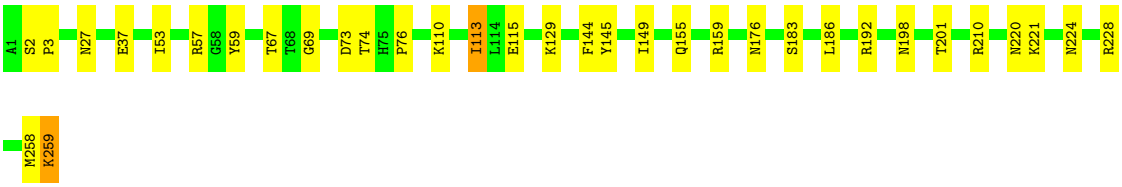
3 Residue-property plots (i)

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. 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. 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.

Note EDS was not executed.

• Molecule 1: PROTEIN (CHITOSANASE)

Chain A:



• Molecule 2: 2-amino-2-deoxy-beta-D-glucopyranose-(1-4)-2-amino-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain B:

4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	43.30Å 128.00Å 57.70Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	5.00 – 1.60	Depositor
% Data completeness (in resolution range)	94.2 (5.00-1.60)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.192 , 0.235	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2226	wwPDB-VP
Average B, all atoms (Å^2)	21.0	wwPDB-VP

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: NAG, GCS, 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	0.44	0/2077	0.64	0/2798

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

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	2037	0	1981	27	0
2	B	36	0	32	4	0
3	A	3	0	0	0	0
4	A	150	0	0	2	0
All	All	2226	0	2013	29	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 7.

All (29) 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)
4:A:461:HOH:O	2:B:2:GCS:O3	1.90	0.89
1:A:37:GLU:O	2:B:1:NAG:C8	2.27	0.82
1:A:220:ASN:HD21	1:A:228:ARG:HH11	1.26	0.80
1:A:198:ASN:HD22	1:A:201:THR:H	1.44	0.64
1:A:69:GLY:HA3	1:A:113:ILE:HG13	1.81	0.61
1:A:155:GLN:HE21	1:A:159:ARG:HH12	1.49	0.60
1:A:37:GLU:O	2:B:1:NAG:H81	2.00	0.59
1:A:3:PRO:HB3	1:A:27:ASN:HB2	1.85	0.58
1:A:145:TYR:HA	1:A:149:ILE:HB	1.87	0.57
4:A:461:HOH:O	2:B:3:GCS:O5	1.92	0.57
1:A:53:ILE:HG22	1:A:53:ILE:O	2.04	0.57
1:A:74:THR:HA	1:A:113:ILE:CD1	2.36	0.56
1:A:155:GLN:NE2	1:A:159:ARG:HH12	2.05	0.54
1:A:221:LYS:HD3	1:A:259:LYS:HG2	1.90	0.54
1:A:224:ASN:HD21	1:A:259:LYS:HG3	1.73	0.53
1:A:73:ASP:O	1:A:113:ILE:HD11	2.08	0.53
1:A:74:THR:HA	1:A:113:ILE:HD11	1.91	0.51
1:A:67:THR:O	1:A:76:PRO:HB2	2.11	0.50
1:A:176:ASN:HD22	1:A:210:ARG:HH21	1.63	0.46
1:A:59:TYR:O	1:A:67:THR:HA	2.18	0.44
1:A:3:PRO:HB3	1:A:27:ASN:CB	2.49	0.43
1:A:224:ASN:ND2	1:A:259:LYS:HE2	2.34	0.43
1:A:258:MET:O	1:A:259:LYS:HB2	2.19	0.42
1:A:53:ILE:O	1:A:53:ILE:CG2	2.66	0.42
1:A:110:LYS:HE3	1:A:115:GLU:HG3	2.01	0.42
1:A:198:ASN:ND2	1:A:201:THR:H	2.11	0.41
1:A:183:SER:HB2	1:A:192:ARG:NH1	2.36	0.41
1:A:220:ASN:HD21	1:A:228:ARG:NH1	2.04	0.41
1:A:57:ARG:HG2	1:A:73:ASP:HB2	2.02	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	257/259 (99%)	248 (96%)	9 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	217/217 (100%)	211 (97%)	6 (3%)	43	18

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	SER
1	A	113	ILE
1	A	129	LYS
1	A	144	PHE
1	A	186	LEU
1	A	259	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	155	GLN
1	A	158	GLN
1	A	176	ASN
1	A	198	ASN
1	A	220	ASN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

3 monosaccharides 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	NAG	B	1	2	15,15,15	2.38	3 (20%)	21,21,21	3.06	9 (42%)
2	GCS	B	2	2	11,11,12	2.13	5 (45%)	12,15,17	3.27	5 (41%)
2	GCS	B	3	2	10,10,12	1.61	2 (20%)	9,13,17	2.75	5 (55%)

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	NAG	B	1	2	-	0/6/26/26	0/1/1/1
2	GCS	B	2	2	-	0/2/19/22	0/1/1/1
2	GCS	B	3	2	-	0/2/15/22	0/1/1/1

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1	NAG	O4-C4	7.14	1.59	1.43
2	B	2	GCS	O3-C3	3.98	1.52	1.43
2	B	1	NAG	C7-N2	-3.24	1.23	1.34
2	B	3	GCS	O3-C3	3.16	1.50	1.43
2	B	2	GCS	C6-C5	2.84	1.61	1.51
2	B	2	GCS	O6-C6	2.75	1.54	1.42
2	B	2	GCS	O5-C5	2.65	1.48	1.43
2	B	2	GCS	O5-C1	2.57	1.47	1.43
2	B	1	NAG	O3-C3	2.56	1.49	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	3	GCS	C1-C2	2.45	1.55	1.52

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	2	GCS	O4-C4-C3	-9.22	89.04	110.35
2	B	1	NAG	C2-N2-C7	7.23	140.77	123.18
2	B	1	NAG	C4-C3-C2	6.68	120.13	110.34
2	B	1	NAG	O7-C7-N2	-6.15	110.65	121.95
2	B	3	GCS	C4-C3-C2	5.20	118.89	111.39
2	B	1	NAG	C8-C7-N2	4.11	123.05	116.10
2	B	3	GCS	O6-C6-C5	-4.05	101.04	111.78
2	B	2	GCS	C1-O5-C5	4.02	117.63	112.19
2	B	2	GCS	O4-C4-C5	-3.28	101.16	109.30
2	B	3	GCS	O5-C5-C4	-2.96	105.86	110.65
2	B	3	GCS	C4-C5-C6	2.89	117.68	112.60
2	B	1	NAG	C1-C2-N2	-2.88	107.40	110.73
2	B	2	GCS	O5-C5-C4	-2.86	103.87	110.83
2	B	1	NAG	O5-C1-C2	2.84	112.37	109.52
2	B	2	GCS	C3-C4-C5	-2.79	105.25	110.24
2	B	1	NAG	O3-C3-C2	-2.67	104.27	109.66
2	B	1	NAG	O5-C5-C4	-2.37	105.39	109.69
2	B	3	GCS	C3-C4-C5	-2.34	107.19	111.22
2	B	1	NAG	O7-C7-C8	2.07	125.91	122.06

There are no chirality outliers.

There are no torsion outliers.

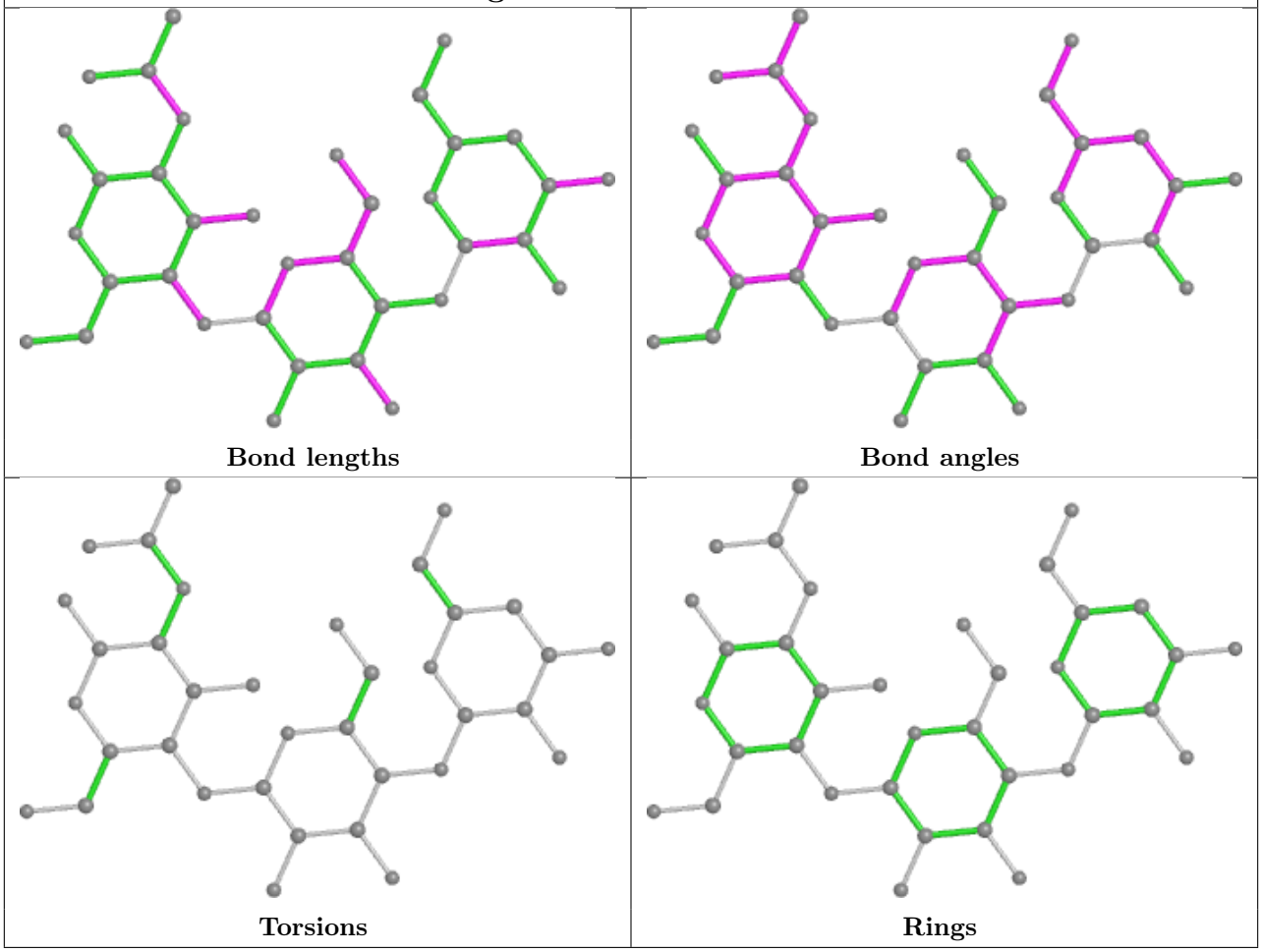
There are no ring outliers.

3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	1	NAG	2	0
2	B	2	GCS	1	0
2	B	3	GCS	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 oligosaccharide.

Oligosaccharide Chain B



5.6 Ligand geometry (i)

1 ligand is 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	500	-	2,2,4	1.17	0	1,1,6	1.42	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.

No monomer is involved in short contacts.

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 (i)

6.1 Protein, DNA and RNA chains (i)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates (i)

EDS was not executed - this section is therefore empty.

6.4 Ligands (i)

EDS was not executed - this section is therefore empty.

6.5 Other polymers (i)

EDS was not executed - this section is therefore empty.