



wwPDB X-ray Structure Validation Summary Report ⓘ

May 26, 2020 – 05:25 pm BST

PDB ID : 3WT3
Title : New crystal form of a hyperthermophilic endocellulase
Authors : Kataoka, M.; Ishikawa, K.
Deposited on : 2014-04-07
Resolution : 1.68 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

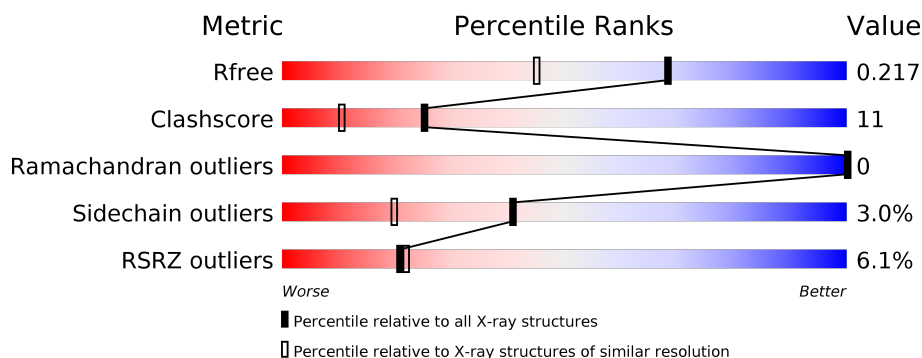
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.68 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}	130704	6780 (1.70-1.66)
Clashscore	141614	7310 (1.70-1.66)
Ramachandran outliers	138981	7173 (1.70-1.66)
Sidechain outliers	138945	7172 (1.70-1.66)
RSRZ outliers	127900	6661 (1.70-1.66)

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 on 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	319	<div> <div style="width: 100%; height: 10px; background-color: red; position: relative;"> % </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> 73% 11% 15% </div> </div>
1	B	319	<div> <div style="width: 100%; height: 10px; background-color: red; position: relative;"> 9% </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> 60% 23% 15% </div> </div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	GOL	A	510	-	X	-	-
3	GOL	A	511	-	X	-	-
3	GOL	A	512	-	X	-	-
3	GOL	B	503	-	X	-	-

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 5011 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.

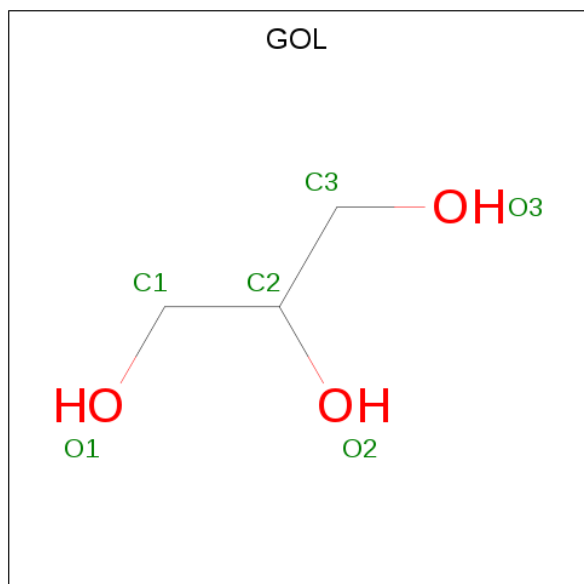
- Molecule 1 is a protein called Endoglucanase A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	270	Total	C	N	O	S	0	1	0
			2175	1416	346	411	2			
1	B	270	Total	C	N	O	S	0	7	0
			2228	1446	357	423	2			

- Molecule 2 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	2	Total	Ca	0	0
			2	2		
2	A	2	Total	Ca	0	0
			2	2		

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).

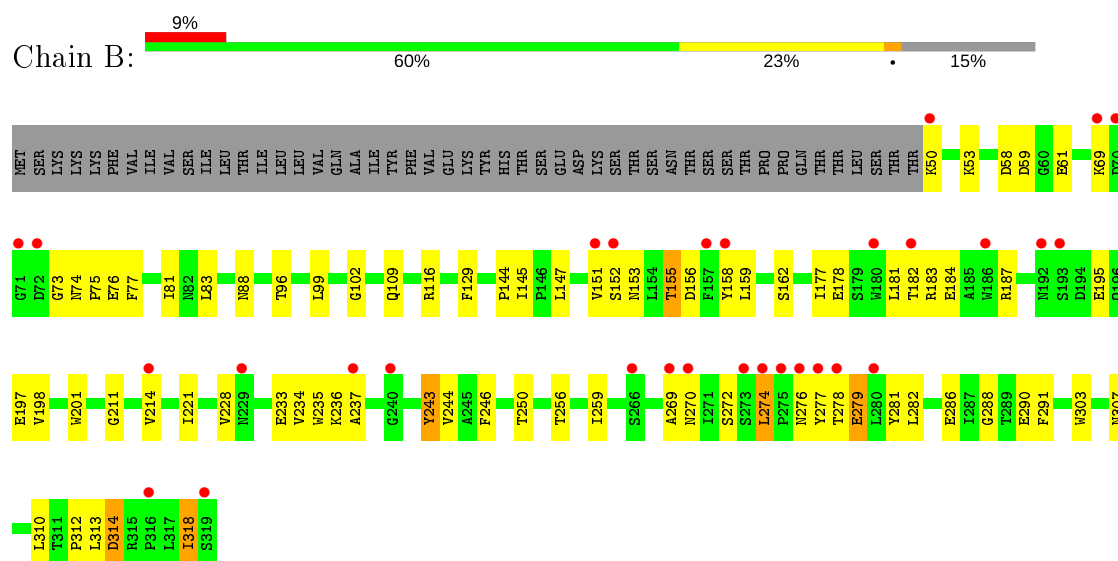
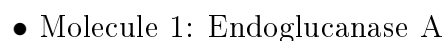


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	312	Total O 319 319	0	6
4	B	197	Total O 201 201	0	4

- Molecule 1: Endoglucanase A



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	134.73 Å 62.57 Å 86.28 Å 90.00° 95.08° 90.00°	Depositor
Resolution (Å)	43.01 – 1.68 42.97 – 1.68	Depositor EDS
% Data completeness (in resolution range)	99.8 (43.01-1.68) 99.8 (42.97-1.68)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.13 (at 1.68 Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.181 , 0.218 0.180 , 0.217	Depositor DCC
R_{free} test set	4096 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	18.3	Xtriage
Anisotropy	0.083	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 58.2	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	0.96	EDS
Total number of atoms	5011	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.61% of the height of the origin peak. No significant pseudotranslation is detected.*

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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, CA

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	1.36	9/2243 (0.4%)	1.28	8/3079 (0.3%)
1	B	1.17	4/2296 (0.2%)	1.12	2/3149 (0.1%)
All	All	1.27	13/4539 (0.3%)	1.20	10/6228 (0.2%)

The worst 5 of 13 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	178	GLU	CD-OE1	-7.52	1.17	1.25
1	A	211	GLY	N-CA	7.38	1.57	1.46
1	A	121	TRP	CB-CG	-6.43	1.38	1.50
1	A	121	TRP	CE3-CZ3	6.41	1.49	1.38
1	B	303	TRP	CE3-CZ3	6.01	1.48	1.38

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	118	ARG	NE-CZ-NH2	6.71	123.66	120.30
1	B	314	ASP	CB-CG-OD2	-6.65	112.32	118.30
1	A	284	ASP	CB-CG-OD2	-6.54	112.41	118.30
1	B	155	THR	N-CA-CB	-5.96	98.98	110.30
1	A	139	TYR	CB-CG-CD1	-5.69	117.58	121.00

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	2175	0	2111	16	0
1	B	2228	0	2156	71	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
3	A	60	0	79	10	0
3	B	24	0	32	8	0
4	A	319	0	0	9	0
4	B	201	0	0	18	0
All	All	5011	0	4378	95	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 11.

The worst 5 of 95 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)
3:A:511:GOL:H12	4:A:904:HOH:O	1.25	1.31
3:A:509:GOL:H32	4:A:902:HOH:O	1.32	1.22
1:B:88:ASN:HB2	4:B:796:HOH:O	1.58	1.02
1:B:88:ASN:CB	4:B:796:HOH:O	2.18	0.89
1:A:238[B]:ASN:OD1	4:A:752:HOH:O	1.90	0.87

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	269/319 (84%)	261 (97%)	8 (3%)	0	100	100
1	B	275/319 (86%)	261 (95%)	14 (5%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	544/638 (85%)	522 (96%)	22 (4%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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	237/284 (84%)	234 (99%)	3 (1%)	69	54
1	B	243/284 (86%)	232 (96%)	11 (4%)	27	9
All	All	480/568 (84%)	466 (97%)	14 (3%)	41	21

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	155	THR
1	B	214	VAL
1	B	274	LEU
1	B	153	ASN
1	B	270	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 18 ligands modelled in this entry, 4 are monoatomic - leaving 14 for Mogul analysis.

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	507	-	5,5,5	0.50	0	5,5,5	0.97	1 (20%)
3	GOL	A	508	-	5,5,5	0.76	0	5,5,5	1.05	0
3	GOL	A	503	-	5,5,5	2.10	2 (40%)	5,5,5	1.31	1 (20%)
3	GOL	A	510	-	5,5,5	1.19	0	5,5,5	1.99	3 (60%)
3	GOL	A	504	-	5,5,5	0.57	0	5,5,5	0.94	0
3	GOL	B	506	-	5,5,5	0.59	0	5,5,5	0.93	0
3	GOL	B	505	-	5,5,5	0.64	0	5,5,5	1.14	0
3	GOL	A	509	-	5,5,5	0.88	0	5,5,5	1.22	1 (20%)
3	GOL	B	504	-	5,5,5	0.43	0	5,5,5	0.73	0
3	GOL	A	505	-	5,5,5	1.10	0	5,5,5	1.37	1 (20%)
3	GOL	A	506	-	5,5,5	0.46	0	5,5,5	1.65	2 (40%)
3	GOL	A	511	-	5,5,5	0.93	0	5,5,5	3.32	3 (60%)
3	GOL	B	503	-	5,5,5	0.53	0	5,5,5	1.64	2 (40%)
3	GOL	A	512	-	5,5,5	1.58	1 (20%)	5,5,5	2.83	2 (40%)

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	507	-	-	0/4/4/4	-
3	GOL	A	508	-	-	2/4/4/4	-
3	GOL	A	503	-	-	2/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	GOL	A	510	-	-	4/4/4/4	-
3	GOL	A	504	-	-	2/4/4/4	-
3	GOL	B	506	-	-	2/4/4/4	-
3	GOL	B	505	-	-	4/4/4/4	-
3	GOL	A	509	-	-	0/4/4/4	-
3	GOL	B	504	-	-	2/4/4/4	-
3	GOL	A	505	-	-	2/4/4/4	-
3	GOL	A	506	-	-	2/4/4/4	-
3	GOL	A	511	-	-	3/4/4/4	-
3	GOL	B	503	-	-	4/4/4/4	-
3	GOL	A	512	-	-	4/4/4/4	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	503	GOL	O1-C1	3.38	1.56	1.42
3	A	512	GOL	C1-C2	-2.82	1.40	1.51
3	A	503	GOL	O3-C3	2.37	1.52	1.42

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	511	GOL	O2-C2-C3	-5.56	84.62	109.12
3	A	512	GOL	O1-C1-C2	-4.89	86.74	110.20
3	A	511	GOL	O2-C2-C1	-3.66	93.00	109.12
3	A	512	GOL	O3-C3-C2	-3.35	94.15	110.20
3	A	511	GOL	C3-C2-C1	3.09	123.74	111.70

There are no chirality outliers.

5 of 33 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	508	GOL	O1-C1-C2-C3
3	A	510	GOL	C1-C2-C3-O3
3	B	505	GOL	C1-C2-C3-O3
3	A	504	GOL	C1-C2-C3-O3
3	A	505	GOL	O1-C1-C2-C3

There are no ring outliers.

11 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	507	GOL	1	0
3	A	508	GOL	1	0
3	A	510	GOL	1	0
3	A	504	GOL	3	0
3	B	506	GOL	1	0
3	B	505	GOL	1	0
3	A	509	GOL	2	0
3	B	504	GOL	3	0
3	A	505	GOL	1	0
3	A	511	GOL	2	0
3	B	503	GOL	3	0

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](#)

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	270/319 (84%)	-0.46	3 (1%) 80 83	9, 16, 32, 69	0
1	B	270/319 (84%)	0.57	30 (11%) 5 5	11, 32, 55, 77	0
All	All	540/638 (84%)	0.05	33 (6%) 21 22	9, 22, 51, 77	0

The worst 5 of 33 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	71	GLY	4.3
1	B	274	LEU	4.0
1	B	277	TYR	4.0
1	B	319	SER	3.7
1	B	71	GLY	3.7

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 carbohydrates 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(\AA^2)	Q<0.9
2	CA	B	502	1/1	0.71	0.10	64,64,64,64	0
3	GOL	A	508	6/6	0.77	0.12	39,51,57,61	0
3	GOL	A	503	6/6	0.79	0.18	23,34,43,45	0
3	GOL	A	504	6/6	0.83	0.13	40,48,49,57	0
3	GOL	B	503	6/6	0.83	0.15	28,42,47,56	0
3	GOL	B	504	6/6	0.84	0.17	42,44,47,48	6
3	GOL	A	510	6/6	0.87	0.17	20,25,28,28	6
3	GOL	A	506	6/6	0.88	0.12	40,45,47,49	0
3	GOL	A	505	6/6	0.90	0.11	21,36,46,49	0
3	GOL	B	505	6/6	0.91	0.12	30,30,37,43	6
3	GOL	B	506	6/6	0.92	0.11	40,43,51,60	0
2	CA	B	501	1/1	0.93	0.10	52,52,52,52	1
3	GOL	A	511	6/6	0.94	0.14	10,21,22,25	6
3	GOL	A	512	6/6	0.94	0.17	13,20,27,31	6
3	GOL	A	509	6/6	0.96	0.12	10,26,29,30	6
3	GOL	A	507	6/6	0.96	0.10	23,39,44,51	0
2	CA	A	501	1/1	0.98	0.11	34,34,34,34	1
2	CA	A	502	1/1	0.99	0.04	21,21,21,21	1

6.5 Other polymers ⓘ

There are no such residues in this entry.