



wwPDB X-ray Structure Validation Summary Report

Oct 2, 2014 – 05:56 PM EDT

PDB ID : 4UTV
Title : Crystal structure of zebrafish Sirtuin 5 in complex with 3-phenyl- succinylated CPS1-peptide
Authors : Pannek, M.; Gertz, M.; Steegborn, C.
Deposited on : 2014-07-23
Resolution : 2.40 Å(reported)

This is a wwPDB validation summary report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

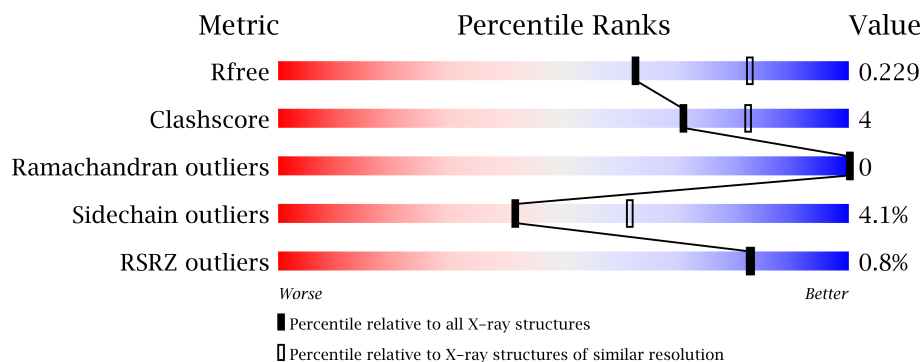
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.16 November 2013
Xtriage (Phenix) : dev-1439
EDS : stable23828
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable23828

1 Overall quality at a glance

The reported resolution of this entry is 2.40 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}	66092	2207 (2.40-2.40)
Clashscore	79885	2789 (2.40-2.40)
Ramachandran outliers	78287	2736 (2.40-2.40)
Sidechain outliers	78261	2737 (2.40-2.40)
RSRZ outliers	66119	2210 (2.40-2.40)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	275	
1	B	275	
2	C	9	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
4	EPE	B	1300	-	X
6	NA	B	1302	-	X

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 4344 atoms, of which 0 are hydrogen and 0 are deuterium.

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 NAD-DEPENDENT PROTEIN DEACYLASE SIRTUIN-5, MITOCHONDRIAL.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	257	Total	C	N	O	S	0	2	0
			2013	1271	364	363	15			
1	B	259	Total	C	N	O	S	0	0	0
			2013	1272	361	366	14			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	24	GLY	-	EXPRESSION TAG	UNP Q6DHI5
A	25	ILE	-	EXPRESSION TAG	UNP Q6DHI5
A	26	ASP	-	EXPRESSION TAG	UNP Q6DHI5
A	27	PRO	-	EXPRESSION TAG	UNP Q6DHI5
A	28	PHE	-	EXPRESSION TAG	UNP Q6DHI5
A	29	THR	-	EXPRESSION TAG	UNP Q6DHI5
B	24	GLY	-	EXPRESSION TAG	UNP Q6DHI5
B	25	ILE	-	EXPRESSION TAG	UNP Q6DHI5
B	26	ASP	-	EXPRESSION TAG	UNP Q6DHI5
B	27	PRO	-	EXPRESSION TAG	UNP Q6DHI5
B	28	PHE	-	EXPRESSION TAG	UNP Q6DHI5
B	29	THR	-	EXPRESSION TAG	UNP Q6DHI5

- Molecule 2 is a protein called CARBAMOYLPHOSPHATE SYNTHETASE I.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	9	Total	C	N	O	0	9	0
			136	94	18	24			

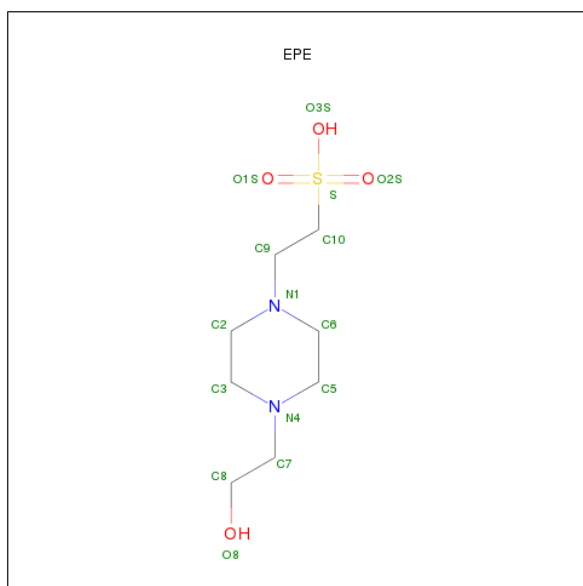
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	0	BEZ	-	BENZOYLATION	UNP Q5R209

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

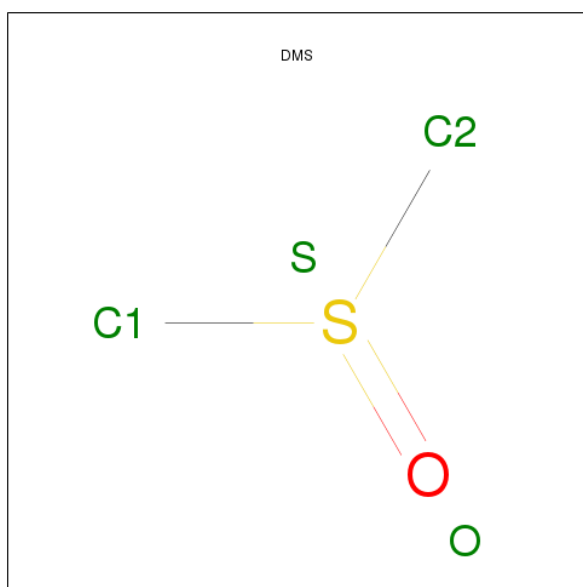
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Zn	0	0
			1	1		
3	A	1	Total	Zn	0	0
			1	1		

- Molecule 4 is 4-(2-HYDROXYETHYL)-1-PIPERAZINEETHANESULFONIC ACID (three-letter code: EPE) (formula: C₈H₁₈N₂O₄S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	B	1	Total	C	N	O	S	0	0
			15	8	2	4	1		

- Molecule 5 is DIMETHYL SULFOXIDE (three-letter code: DMS) (formula: C₂H₆OS).

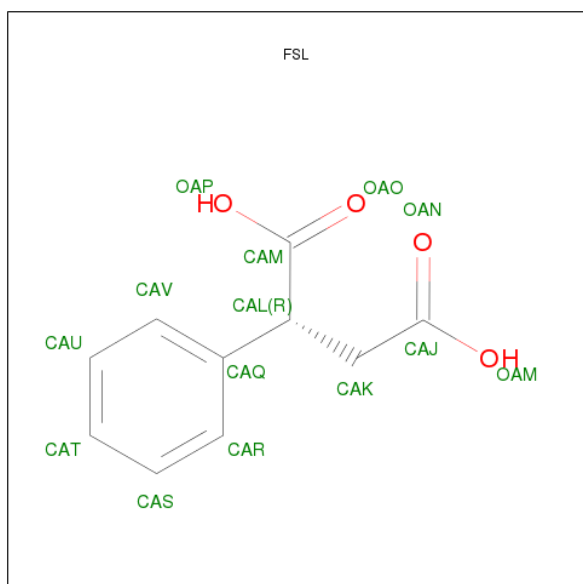


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	B	1	Total	C	O	S	0	0
			4	2	1	1		

- Molecule 6 is SODIUM ION (three-letter code: NA) (formula: Na).

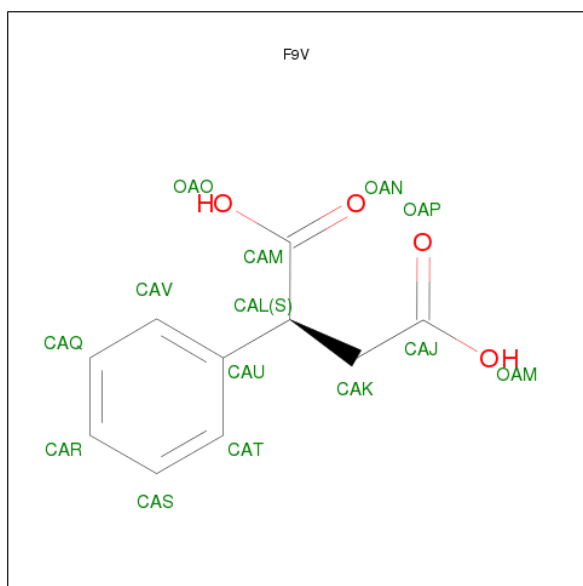
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	1	Total	Na	0	0
			1	1		

- Molecule 7 is (2R)-2-PHENYLBUTANEDIOICACID (three-letter code: FSL) (formula: C₁₀H₁₀O₄).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	C	1	Total	C	O	0	1
			13	10	3		

- Molecule 8 is (2S)-2-PHENYLBUTANEDIOICACID (three-letter code: F9V) (formula: $C_{10}H_{10}O_4$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	C	1	Total	C	O	0	1
			13	10	3		

- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	89	Total	O	0	0
			89	89		
9	B	44	Total	O	0	0
			44	44		
9	C	1	Total	O	0	0
			1	1		

4 Data and refinement statistics

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, α , β , γ	88.91Å 88.91Å 305.33Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	47.85 – 2.40 47.85 – 2.40	Depositor EDS
% Data completeness (in resolution range)	99.9 (47.85-2.40) 99.9 (47.85-2.40)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.41 (at 2.39Å)	Xtriage
Refinement program	REFMAC 5.8.0073	Depositor
R, R_{free}	0.197 , 0.227 0.202 , 0.229	Depositor DCC
R_{free} test set	1427 reflections (5.18%)	DCC
Wilson B-factor (Å ²)	38.3	Xtriage
Anisotropy	0.252	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 26.5	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 28997 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4344	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.39% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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: ZN, NA, FSL, BEZ, DMS, F9V, EPE

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	0.85	0/2070	0.95	6/2804 (0.2%)
1	B	0.81	0/2066	0.93	4/2798 (0.1%)
2	C	0.69	0/120	1.15	0/158
All	All	0.83	0/4256	0.95	10/5760 (0.2%)

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
1	A	0	1

There are no bond length outliers.

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	187	ASP	CB-CG-OD1	6.73	124.36	118.30
1	A	74	ARG	NE-CZ-NH1	5.97	123.29	120.30
1	B	272	MET	N-CA-C	-5.89	95.11	111.00
1	A	74	ARG	NE-CZ-NH2	-5.82	117.39	120.30
1	A	115	LEU	CA-CB-CG	-5.69	102.22	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	68	GLY	Peptide

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2013	0	1974	20	0
1	B	2013	0	1975	19	0
2	C	136	0	132	3	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	B	15	0	18	1	0
5	B	4	0	6	0	0
6	B	1	0	0	0	0
7	C	13	0	0	1	0
8	C	13	0	0	1	0
9	A	89	0	0	2	0
9	B	44	0	0	2	0
9	C	1	0	0	0	0
All	All	4344	0	4105	37	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 4.

The worst 5 of 37 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:132:VAL:HG12	1:A:149[A]:HIS:CD2	2.08	0.88
1:A:115:LEU:HB3	1:B:109:MET:HE2	1.68	0.76
2:C:4[B]:LYS:HG3	2:C:5[B]:GLU:HG2	1.71	0.72
1:A:67:ARG:HD2	9:A:2011:HOH:O	1.96	0.65
1:B:209:ASN:HB2	9:B:2039:HOH:O	2.02	0.59

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone ⓘ

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	255/275 (93%)	250 (98%)	5 (2%)	0	100	100
1	B	255/275 (93%)	251 (98%)	4 (2%)	0	100	100
2	C	14/9 (156%)	12 (86%)	2 (14%)	0	100	100
All	All	524/559 (94%)	513 (98%)	11 (2%)	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	215/229 (94%)	206 (96%)	9 (4%)	40	60
1	B	215/229 (94%)	205 (95%)	10 (5%)	36	54
2	C	12/6 (200%)	12 (100%)	0	100	100
All	All	442/464 (95%)	423 (96%)	19 (4%)	41	59

5 of 19 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	298	GLU
1	B	75	LYS
1	B	238	CYS
1	A	274	CYS
1	B	260	VAL

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 chains 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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 7 ligands modelled in this entry, 3 are monoatomic - leaving 4 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$
4	EPE	B	1300	-	15,15,15	2.13	2 (13%)	20,20,20	3.45	9 (45%)
5	DMS	B	1301	-	3,3,3	0.60	0	3,3,3	0.75	0
7	FSL	C	1004[A]	2	13,13,14	5.96	2 (15%)	14,16,18	1.23	1 (7%)
8	F9V	C	1005[B]	2	13,13,14	5.74	2 (15%)	14,16,18	1.84	2 (14%)

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
4	EPE	B	1300	-	-	0/9/19/19	0/1/1/1
5	DMS	B	1301	-	-	0/0/0/0	0/0/0/0
7	FSL	C	1004[A]	2	-	0/10/11/12	0/1/1/1
8	F9V	C	1005[B]	2	-	0/10/11/12	0/1/1/1

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	C	1004[A]	FSL	OAN-CAJ	18.79	1.24	1.11
8	C	1005[B]	F9V	OAP-CAJ	17.63	1.23	1.11

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	C	1005[B]	F9V	CAU-CAL	-10.49	1.36	1.52
7	C	1004[A]	FSL	CAQ-CAL	-10.25	1.37	1.52
4	B	1300	EPE	C10-S	-7.07	1.67	1.77

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	1300	EPE	O1S-S-C10	9.03	114.83	106.79
4	B	1300	EPE	C2-C3-N4	-6.46	98.00	110.61
4	B	1300	EPE	O3S-S-C10	-5.52	99.28	105.93
8	C	1005[B]	F9V	CAK-CAL-CAU	-5.20	102.21	111.89
4	B	1300	EPE	O3S-S-O1S	5.13	123.10	111.69

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues

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	257/275 (93%)	-0.43	2 (0%) 83 82	22, 35, 70, 118	0
1	B	259/275 (94%)	-0.17	2 (0%) 83 82	26, 44, 78, 104	0
2	C	9/9 (100%)	-0.24	0 100 100	34, 36, 54, 71	0
All	All	525/559 (93%)	-0.30	4 (0%) 83 82	22, 39, 73, 118	0

All (4) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	189	ASN	3.8
1	B	33	SER	2.5
1	A	69	PRO	2.4
1	A	206	LYS	2.3

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

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

6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

6.4 Ligands ⓘ

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	RSR	LLDF	B-factors(\AA^2)	Q<0.9
6	NA	B	1302	1/1	0.31	11.93	62,62,62,62	1
4	EPE	B	1300	15/15	0.18	2.39	43,61,68,70	0
5	DMS	B	1301	4/4	0.15	0.95	48,50,55,60	0
8	F9V	C	1005[B]	13/14	0.12	-0.26	28,30,32,33	13
3	ZN	A	1299	1/1	0.10	-0.37	30,30,30,30	0
7	FSL	C	1004[A]	13/14	0.11	-0.59	34,39,45,45	13
3	ZN	B	1299	1/1	0.08	-1.71	45,45,45,45	0

6.5 Other polymers ⓘ

There are no such residues in this entry.