



wwPDB X-ray Structure Validation Summary Report ⓘ

May 29, 2020 – 04:41 pm BST

PDB ID : 2WJV
Title : Crystal structure of the complex between human nonsense mediated decay factors UPF1 and UPF2
Authors : Clerici, M.; Mourao, A.; Gutsche, I.; Gehring, N.H.; Hentze, M.W.; Kulozik, A.; Kadlec, J.; Sattler, M.; Cusack, S.
Deposited on : 2009-06-01
Resolution : 2.85 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

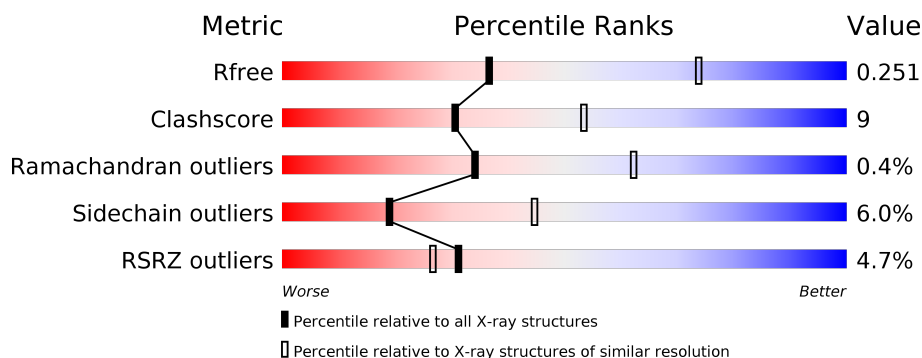
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.85 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	3168 (2.90-2.82)
Clashscore	141614	3438 (2.90-2.82)
Ramachandran outliers	138981	3348 (2.90-2.82)
Sidechain outliers	138945	3351 (2.90-2.82)
RSRZ outliers	127900	3103 (2.90-2.82)

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	800	<div> <div>4%</div> <div> <div></div> <div>78%</div> <div>17%</div> <div>• •</div> </div> </div>
1	B	800	<div> <div>4%</div> <div> <div></div> <div>77%</div> <div>17%</div> <div>• •</div> </div> </div>
2	D	97	<div> <div>2%</div> <div> <div></div> <div>47%</div> <div>6%</div> <div>•</div> <div>44%</div> </div> </div>
2	E	97	<div> <div>9%</div> <div> <div></div> <div>43%</div> <div>15%</div> <div>•</div> <div>38%</div> </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 crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	SO4	A	994	-	-	X	-
4	SO4	A	998	-	-	X	-
4	SO4	B	999	-	-	X	-

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 13187 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 REGULATOR OF NONSENSE TRANSCRIPTS 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	772	Total	C	N	O	S	0	0	0
			6094	3867	1067	1125	35			
1	B	768	Total	C	N	O	S	0	0	0
			6073	3858	1065	1115	35			

- Molecule 2 is a protein called REGULATOR OF NONSENSE TRANSCRIPTS 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	54	Total	C	N	O	S	0	0	0
			426	268	70	81	7			
2	E	60	Total	C	N	O	S	0	0	0
			473	295	82	89	7			

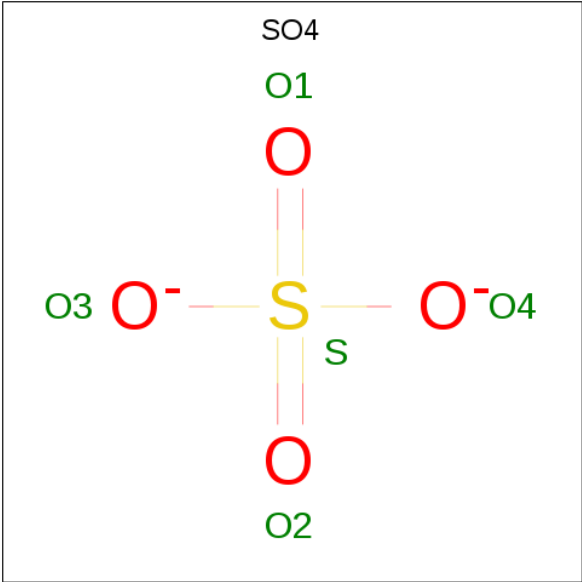
There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	1102	ALA	-	expression tag	UNP Q9HAU5
D	1103	MET	-	expression tag	UNP Q9HAU5
D	1104	GLY	-	expression tag	UNP Q9HAU5
E	1102	ALA	-	expression tag	UNP Q9HAU5
E	1103	MET	-	expression tag	UNP Q9HAU5
E	1104	GLY	-	expression tag	UNP Q9HAU5

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

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

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O₄S).

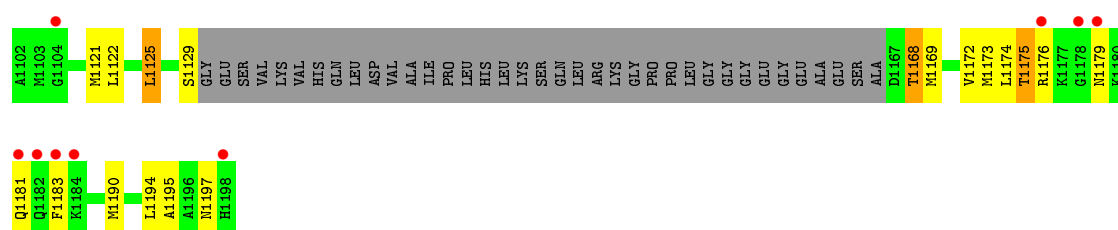


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total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

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



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	92.41 Å 97.29 Å 124.60 Å 90.00° 102.38° 90.00°	Depositor
Resolution (Å)	48.79 – 2.85 48.77 – 2.85	Depositor EDS
% Data completeness (in resolution range)	96.9 (48.79-2.85) 96.9 (48.77-2.85)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.33 (at 2.86 Å)	Xtriage
Refinement program	REFMAC 5.5.0038	Depositor
R, R_{free}	0.200 , 0.248 0.206 , 0.251	Depositor DCC
R_{free} test set	2463 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	64.9	Xtriage
Anisotropy	0.265	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 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	0.94	EDS
Total number of atoms	13187	wwPDB-VP
Average B, all atoms (Å ²)	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.78% 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: ZN, 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	0.53	1/6215 (0.0%)	0.61	0/8412
1	B	0.54	1/6194 (0.0%)	0.62	0/8382
2	D	0.45	0/430	0.59	0/576
2	E	0.51	0/478	0.65	0/639
All	All	0.53	2/13317 (0.0%)	0.62	0/18009

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	664	CYS	CB-SG	-5.58	1.72	1.81
1	A	664	CYS	CB-SG	-5.45	1.73	1.81

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	6094	0	6140	107	0
1	B	6073	0	6126	119	0
2	D	426	0	421	18	0
2	E	473	0	475	11	0
3	A	3	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	3	0	0	0	0
4	A	65	0	0	8	0
4	B	50	0	0	4	0
All	All	13187	0	13162	243	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 9.

The worst 5 of 243 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:206:VAL:CG1	2:D:1174:LEU:HD12	1.94	0.98
1:B:364:LEU:HD22	1:B:393:ILE:HD11	1.46	0.97
1:A:364:LEU:HD22	1:A:393:ILE:HD11	1.49	0.91
1:B:524:ASN:HD22	1:B:543:ARG:HH22	1.15	0.91
1:A:584:THR:HG22	1:A:585:GLY:O	1.71	0.89

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	760/800 (95%)	728 (96%)	27 (4%)	5 (1%)	22	50
1	B	754/800 (94%)	720 (96%)	32 (4%)	2 (0%)	41	68
2	D	48/97 (50%)	42 (88%)	6 (12%)	0	100	100
2	E	56/97 (58%)	53 (95%)	3 (5%)	0	100	100
All	All	1618/1794 (90%)	1543 (95%)	68 (4%)	7 (0%)	34	62

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	759	SER
1	B	215	SER
1	A	216	GLN
1	A	339	LYS
1	A	287	GLU

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	673/699 (96%)	639 (95%)	34 (5%)	24	52
1	B	671/699 (96%)	629 (94%)	42 (6%)	18	42
2	D	49/82 (60%)	46 (94%)	3 (6%)	18	43
2	E	54/82 (66%)	46 (85%)	8 (15%)	3	8
All	All	1447/1562 (93%)	1360 (94%)	87 (6%)	19	45

5 of 87 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	209	CYS
1	B	279	ASP
2	E	1122	LEU
1	B	210	ARG
1	B	260	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 38 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	138	ASN
1	B	228	GLN
1	B	752	GLN
1	B	150	ASN
1	B	291	HIS

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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 29 ligands modelled in this entry, 6 are monoatomic - leaving 23 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	SO4	B	993	-	4,4,4	0.13	0	6,6,6	0.11	0
4	SO4	A	992	-	4,4,4	0.20	0	6,6,6	0.49	0
4	SO4	A	999	-	4,4,4	0.15	0	6,6,6	0.22	0
4	SO4	A	989	-	4,4,4	0.16	0	6,6,6	0.37	0
4	SO4	B	999	-	4,4,4	0.15	0	6,6,6	0.58	0
4	SO4	B	995	-	4,4,4	0.19	0	6,6,6	0.38	0
4	SO4	A	988	-	4,4,4	0.12	0	6,6,6	0.18	0
4	SO4	B	991	-	4,4,4	0.12	0	6,6,6	0.17	0
4	SO4	B	998	-	4,4,4	0.14	0	6,6,6	0.24	0
4	SO4	A	987	-	4,4,4	0.17	0	6,6,6	0.14	0
4	SO4	B	996	-	4,4,4	0.14	0	6,6,6	0.13	0
4	SO4	A	994	-	4,4,4	0.15	0	6,6,6	0.26	0
4	SO4	B	997	-	4,4,4	0.12	0	6,6,6	0.11	0
4	SO4	B	990	-	4,4,4	0.14	0	6,6,6	0.27	0
4	SO4	A	995	-	4,4,4	0.21	0	6,6,6	0.17	0
4	SO4	A	991	-	4,4,4	0.14	0	6,6,6	0.16	0
4	SO4	A	996	-	4,4,4	0.14	0	6,6,6	0.25	0
4	SO4	B	992	-	4,4,4	0.15	0	6,6,6	0.18	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
4	SO4	A	990	-	4,4,4	0.34	0	6,6,6	0.78	0
4	SO4	A	997	-	4,4,4	0.14	0	6,6,6	0.13	0
4	SO4	A	993	-	4,4,4	0.13	0	6,6,6	0.26	0
4	SO4	A	998	-	4,4,4	0.19	0	6,6,6	0.20	0
4	SO4	B	989	-	4,4,4	0.10	0	6,6,6	0.36	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.

9 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	999	SO4	1	0
4	B	999	SO4	2	0
4	A	988	SO4	1	0
4	B	991	SO4	1	0
4	B	996	SO4	1	0
4	A	994	SO4	2	0
4	A	996	SO4	1	0
4	A	990	SO4	1	0
4	A	998	SO4	2	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	772/800 (96%)	0.20	35 (4%) 33 28	9, 20, 33, 44	0
1	B	768/800 (96%)	0.14	31 (4%) 38 32	8, 20, 34, 46	0
2	D	54/97 (55%)	0.33	2 (3%) 41 36	9, 29, 45, 47	0
2	E	60/97 (61%)	0.62	9 (15%) 2 1	9, 34, 49, 52	0
All	All	1654/1794 (92%)	0.20	77 (4%) 31 27	8, 20, 38, 52	0

The worst 5 of 77 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	1179	ASN	6.1
1	A	377	ILE	5.2
1	A	337	LEU	5.0
1	A	373	LEU	4.5
1	A	368	GLY	4.5

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
4	SO4	A	987	5/5	0.73	0.27	127,127,127,128	0
4	SO4	B	989	5/5	0.75	0.24	118,118,119,119	0
4	SO4	B	992	5/5	0.77	0.25	129,129,129,129	0
4	SO4	A	988	5/5	0.79	0.22	141,141,142,142	0
4	SO4	A	996	5/5	0.81	0.32	138,138,138,138	0
4	SO4	B	990	5/5	0.82	0.31	110,111,111,112	0
4	SO4	A	992	5/5	0.83	0.21	96,97,97,97	0
4	SO4	A	994	5/5	0.85	0.16	126,126,126,127	0
4	SO4	A	998	5/5	0.86	0.19	119,120,120,120	0
4	SO4	A	993	5/5	0.87	0.14	113,113,113,113	0
4	SO4	B	998	5/5	0.87	0.18	104,104,105,105	0
4	SO4	B	999	5/5	0.87	0.22	73,75,76,76	0
4	SO4	B	991	5/5	0.88	0.20	151,151,152,152	0
4	SO4	B	996	5/5	0.89	0.32	152,152,153,153	0
4	SO4	A	989	5/5	0.89	0.18	113,114,114,114	0
4	SO4	B	997	5/5	0.89	0.24	131,131,131,131	0
4	SO4	A	997	5/5	0.91	0.35	133,133,133,133	0
4	SO4	A	991	5/5	0.92	0.10	117,118,118,118	0
4	SO4	A	999	5/5	0.93	0.41	135,135,135,136	0
4	SO4	B	993	5/5	0.94	0.13	106,107,107,108	0
4	SO4	A	990	5/5	0.94	0.17	71,72,73,73	0
4	SO4	B	995	5/5	0.95	0.13	79,80,81,82	0
4	SO4	A	995	5/5	0.96	0.13	96,96,97,97	0
3	ZN	A	3	1/1	0.98	0.10	19,19,19,19	0
3	ZN	B	1	1/1	0.99	0.12	10,10,10,10	0
3	ZN	B	2	1/1	0.99	0.08	24,24,24,24	1
3	ZN	B	3	1/1	0.99	0.13	13,13,13,13	0
3	ZN	A	2	1/1	0.99	0.06	20,20,20,20	1
3	ZN	A	1	1/1	1.00	0.10	11,11,11,11	0

6.5 Other polymers [i](#)

There are no such residues in this entry.