



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 14, 2023 – 05:55 PM EDT

PDB ID : 8F3T  
Title : Crystal structure of Penicillin Binding Protein 5 (PBP5) T485M T499I V629E variant apo form from Enterococcus faecium  
Authors : D'Andrea, E.D.; Choy, M.S.; Schoenle, M.V.; Page, R.; Peti, W.  
Deposited on : 2022-11-10  
Resolution : 2.56 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](mailto: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>.

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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 : 2.36  
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) : 2.36

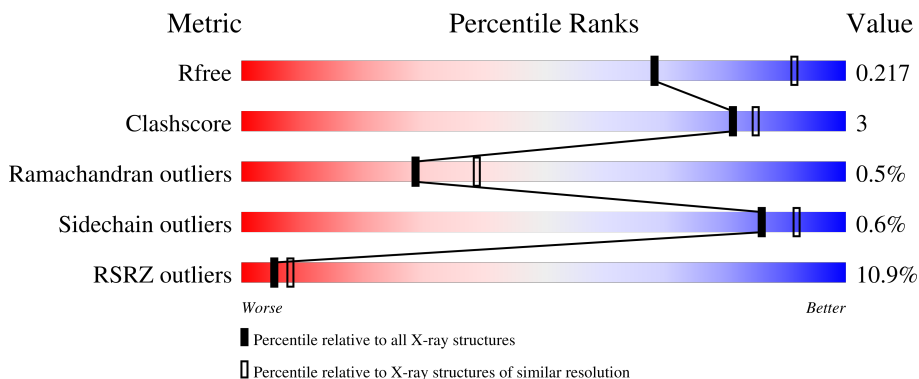
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

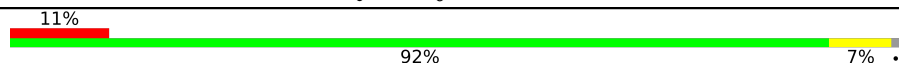
The reported resolution of this entry is 2.56 Å.

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	1279 (2.58-2.54)
Clashscore	141614	1327 (2.58-2.54)
Ramachandran outliers	138981	1312 (2.58-2.54)
Sidechain outliers	138945	1312 (2.58-2.54)
RSRZ outliers	127900	1269 (2.58-2.54)

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  $\geq 3$ , 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	645	

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
2	SO4	A	716	-	-	X	-

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<b>Mol</b>	<b>Type</b>	<b>Chain</b>	<b>Res</b>	<b>Chirality</b>	<b>Geometry</b>	<b>Clashes</b>	<b>Electron density</b>
2	SO4	A	717	-	-	-	X

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 5223 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.

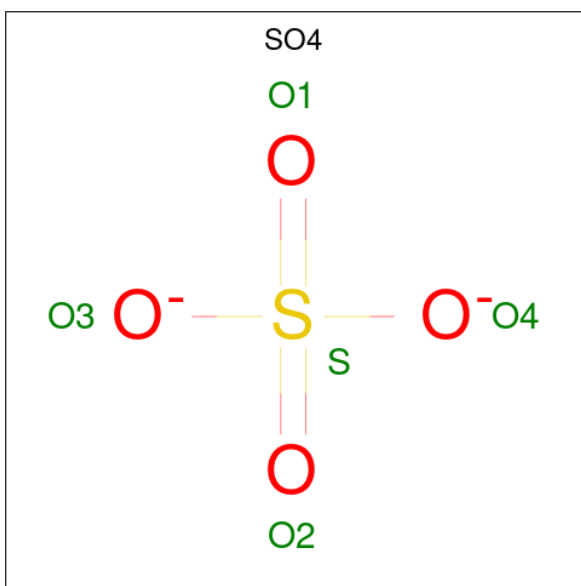
- Molecule 1 is a protein called Penicillin binding protein 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	640	4869	3047	804	1005	13	0	2	0

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	34	GLY	-	expression tag	UNP G5CKR9
A	35	HIS	-	expression tag	UNP G5CKR9
A	36	MET	-	expression tag	UNP G5CKR9
A	485	MET	THR	engineered mutation	UNP G5CKR9
A	499	ILE	THR	engineered mutation	UNP G5CKR9
A	586	VAL	LEU	conflict	UNP G5CKR9
A	629	GLU	VAL	engineered mutation	UNP G5CKR9

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).





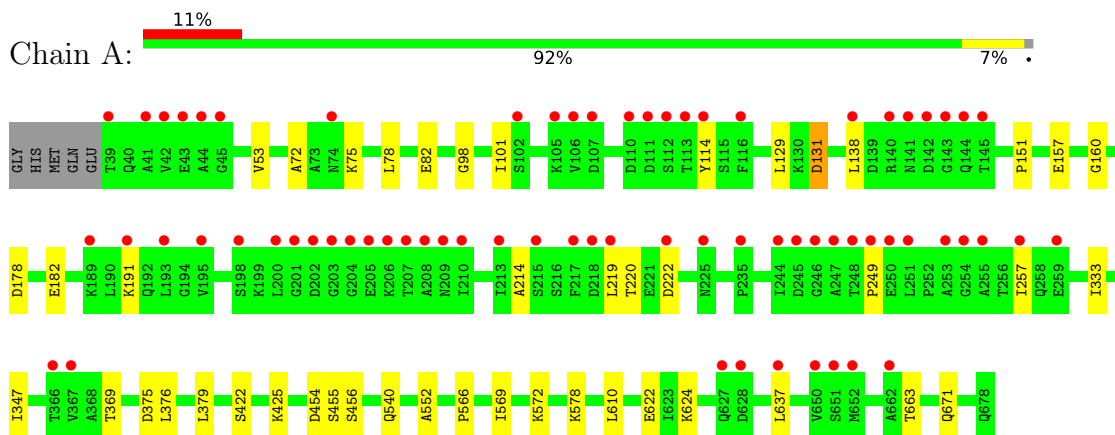
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	256	Total 256	O 256	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: Penicillin binding protein 5



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 63 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	192.78Å 192.78Å 155.43Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	39.78 – 2.56 39.78 – 2.56	Depositor EDS
% Data completeness (in resolution range)	99.9 (39.78-2.56) 99.9 (39.78-2.56)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.11 (at 2.54Å)	Xtrriage
Refinement program	PHENIX 1.19.1_4122	Depositor
R, $R_{free}$	0.192 , 0.214 0.194 , 0.217	Depositor DCC
$R_{free}$ test set	2754 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	62.5	Xtrriage
Anisotropy	0.123	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 57.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	5223	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	74.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.67% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: NA, 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	0.24	0/4949	0.44	0/6698

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	4869	0	4776	23	0
2	A	95	0	0	4	0
3	A	3	0	0	0	0
4	A	256	0	0	2	0
All	All	5223	0	4776	25	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 (25) 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:78:LEU:HB3	1:A:82:GLU:HG3	1.69	0.74
1:A:569:ILE:HB	1:A:572:LYS:HG3	1.82	0.59
1:A:637:LEU:HD22	1:A:663:THR:HA	1.84	0.58
1:A:53:VAL:HG21	1:A:101:ILE:HD13	1.86	0.57
1:A:540:GLN:HE22	1:A:622:GLU:H	1.55	0.55
1:A:129:LEU:HB2	1:A:333:ILE:HD11	1.89	0.54
2:A:716:SO4:O3	4:A:801:HOH:O	2.19	0.53
1:A:369:THR:HG22	1:A:376:LEU:HD23	1.90	0.53
1:A:191:LYS:HE2	1:A:257:ILE:HG21	1.91	0.51
1:A:610:LEU:HD22	1:A:671:GLN:HG3	1.93	0.51
1:A:220:THR:HG22	1:A:222:ASP:H	1.76	0.50
1:A:157:GLU:OE1	1:A:157:GLU:N	2.45	0.49
1:A:178:ASP:OD1	1:A:182:GLU:N	2.41	0.48
1:A:114:TYR:O	1:A:138:LEU:N	2.40	0.47
1:A:455:SER:N	2:A:717:SO4:O4	2.48	0.47
1:A:578:LYS:N	2:A:711:SO4:O2	2.37	0.46
1:A:214:ALA:HA	1:A:219:LEU:HB2	1.98	0.45
1:A:552:ALA:HB2	1:A:566:PRO:HD3	2.00	0.44
1:A:454:ASP:OD1	1:A:456:SER:OG	2.28	0.43
1:A:178:ASP:HB2	1:A:347:ILE:O	2.19	0.42
2:A:716:SO4:O4	4:A:802:HOH:O	2.22	0.41
1:A:72:ALA:HB3	1:A:75:LYS:HB2	2.01	0.41
1:A:376:LEU:HD13	1:A:379:LEU:HD11	2.02	0.41
1:A:151:PRO:HG3	1:A:160:GLY:H	1.86	0.40
1:A:422:SER:HB2	1:A:425:LYS:HZ2	1.85	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	640/645 (99%)	614 (96%)	23 (4%)	3 (0%)	29 39

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	131	ASP
1	A	98	GLY
1	A	249	PRO

### 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	522/534 (98%)	519 (99%)	3 (1%)	<a href="#">86</a> <a href="#">92</a>

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	131	ASP
1	A	375	ASP
1	A	624	LYS

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

### 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](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry

Of 22 ligands modelled in this entry, 3 are monoatomic - leaving 19 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	$\# Z  > 2$
2	SO4	A	712	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	715	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	716	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	714	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	707	-	4,4,4	0.14	0	6,6,6	0.04	0
2	SO4	A	717	-	4,4,4	0.15	0	6,6,6	0.05	0
2	SO4	A	704	-	4,4,4	0.14	0	6,6,6	0.04	0
2	SO4	A	709	-	4,4,4	0.14	0	6,6,6	0.04	0
2	SO4	A	708	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	703	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	713	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	718	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	702	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	701	-	4,4,4	0.15	0	6,6,6	0.05	0
2	SO4	A	705	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	706	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	710	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	719	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	A	711	-	4,4,4	0.13	0	6,6,6	0.05	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.

3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	716	SO4	2	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	717	SO4	1	0
2	A	711	SO4	1	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

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	640/645 (99%)	0.46	70 (10%) <b>5</b> <b>8</b>	44, 65, 128, 163	0

All (70) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	247	ALA	6.3
1	A	114	TYR	5.8
1	A	39	THR	5.6
1	A	202	ASP	5.2
1	A	627	GLN	5.0
1	A	145	THR	5.0
1	A	213	ILE	4.9
1	A	44	ALA	4.9
1	A	253	ALA	4.8
1	A	249	PRO	4.7
1	A	41	ALA	4.6
1	A	200	LEU	4.5
1	A	248	THR	4.4
1	A	111	ASP	4.3
1	A	142	ASP	4.3
1	A	143	GLY	4.2
1	A	140	ARG	4.1
1	A	45	GLY	4.1
1	A	144	GLN	3.9
1	A	113	THR	3.8
1	A	217	PHE	3.8
1	A	201	GLY	3.8
1	A	43	GLU	3.7
1	A	42	VAL	3.7
1	A	106	VAL	3.6
1	A	141	ASN	3.6
1	A	251	LEU	3.6

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	246	GLY	3.5
1	A	206	LYS	3.4
1	A	219	LEU	3.3
1	A	110	ASP	3.3
1	A	195	VAL	3.2
1	A	205	GLU	3.1
1	A	367	VAL	3.1
1	A	112	SER	2.9
1	A	204	GLY	2.9
1	A	245	ASP	2.9
1	A	210	ILE	2.9
1	A	193	LEU	2.9
1	A	215	SER	2.8
1	A	189	LYS	2.8
1	A	222	ASP	2.8
1	A	218	ASP	2.7
1	A	105	LYS	2.7
1	A	662	ALA	2.6
1	A	257	ILE	2.6
1	A	650	VAL	2.6
1	A	652	MET	2.6
1	A	250	GLU	2.6
1	A	207	THR	2.6
1	A	203	GLY	2.6
1	A	628	ASP	2.6
1	A	208	ALA	2.5
1	A	191	LYS	2.5
1	A	259	GLU	2.5
1	A	116	PHE	2.4
1	A	244	ILE	2.4
1	A	138	LEU	2.4
1	A	209	ASN	2.4
1	A	255	ALA	2.4
1	A	102	SER	2.3
1	A	107	ASP	2.3
1	A	198	SER	2.2
1	A	651	SER	2.2
1	A	254	GLY	2.2
1	A	225	ASN	2.2
1	A	74	ASN	2.2
1	A	235	PRO	2.1
1	A	637	LEU	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	366	THR	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 monosaccharides 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
2	SO4	A	717	5/5	0.75	0.46	85,88,115,123	5
2	SO4	A	714	5/5	0.76	0.34	80,107,120,131	5
2	SO4	A	711	5/5	0.81	0.29	69,77,89,89	5
2	SO4	A	715	5/5	0.85	0.13	95,102,127,129	5
2	SO4	A	718	5/5	0.85	0.25	66,66,93,107	5
2	SO4	A	719	5/5	0.87	0.30	111,118,147,149	0
2	SO4	A	710	5/5	0.89	0.15	52,53,95,104	5
2	SO4	A	716	5/5	0.90	0.26	42,54,71,90	5
2	SO4	A	712	5/5	0.90	0.21	76,83,96,106	5
2	SO4	A	707	5/5	0.91	0.15	68,69,99,118	5
3	NA	A	721	1/1	0.92	0.31	63,63,63,63	0
2	SO4	A	706	5/5	0.93	0.23	69,74,89,91	5
2	SO4	A	708	5/5	0.93	0.16	79,86,98,103	5
2	SO4	A	713	5/5	0.94	0.18	90,97,103,109	5
2	SO4	A	705	5/5	0.94	0.20	56,57,79,80	5
2	SO4	A	709	5/5	0.95	0.10	86,88,105,107	5
2	SO4	A	704	5/5	0.95	0.09	79,91,103,107	5
3	NA	A	722	1/1	0.95	0.35	66,66,66,66	0
2	SO4	A	702	5/5	0.97	0.19	56,66,82,102	5
3	NA	A	720	1/1	0.98	0.12	66,66,66,66	0
2	SO4	A	703	5/5	0.99	0.11	66,70,78,86	5
2	SO4	A	701	5/5	0.99	0.15	54,58,73,76	5



## 6.5 Other polymers [i](#)

There are no such residues in this entry.