Full wwPDB X-ray Structure Validation Report ⓘ

Jun 11, 2024 – 07:03 PM EDT

PDB ID	:	1HD8
Title	:	Crystal structure of a deacylation-defective mutant of penicillin-binding protein 5 at 2.3 A resolution
Authors	:	Davies, C.; White, S.W.; Nicholas, R.A.
Deposited on	:	2000-11-11
Resolution	:	2.30 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 ⓘ 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 ⓘ) were used in the production of this report:

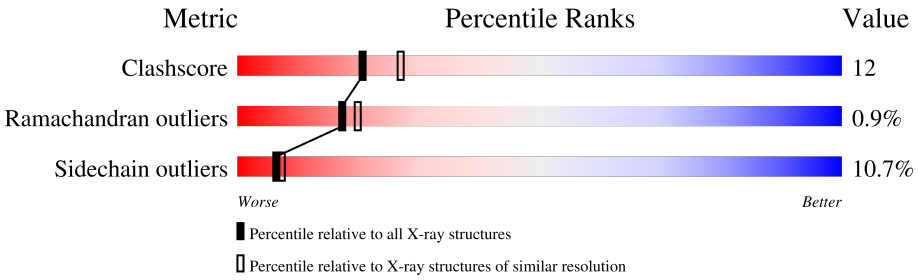
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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 2.30 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	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)

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	363	59% 25% 6% • 7%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 2751 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
1	A	337	Total	C	N	O	S	0	0	0
			2606	1641	453	500	12			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	105	ASP	GLY	engineered mutation	UNP P04287

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	145	Total	O	0	0
			145	145		

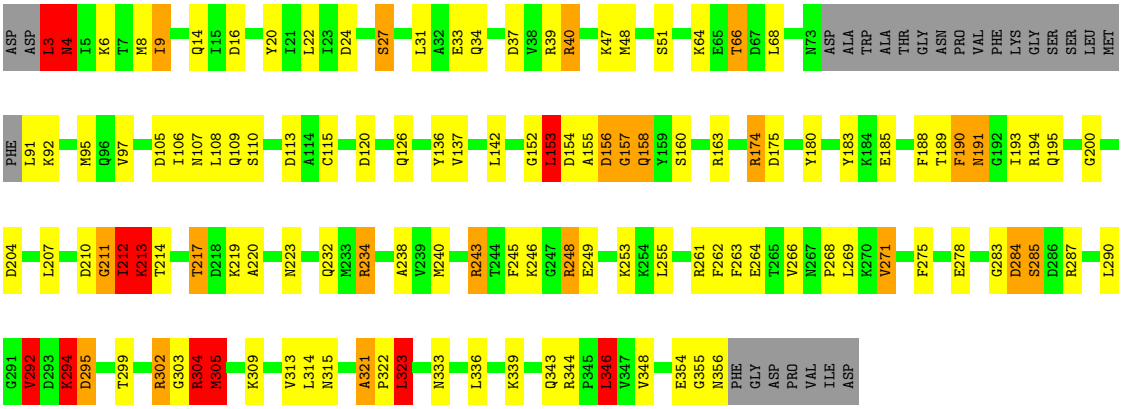
3 Residue-property plots (i)

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: PENICILLIN-BINDING PROTEIN 5

Chain A:



4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, α, β, γ	50.83Å 50.83Å 140.29Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	15.00 – 2.30	Depositor
% Data completeness (in resolution range)	95.4 (15.00-2.30)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
Refinement program	REFMAC	Depositor
R, R_{free}	0.199 , 0.283	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2751	wwPDB-VP
Average B, all atoms (Å^2)	35.0	wwPDB-VP

5 Model quality (i)

5.1 Standard geometry (i)

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	0.76	3/2649 (0.1%)	2.10	81/3575 (2.3%)

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	7

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	157	GLY	N-CA	-7.04	1.35	1.46
1	A	212	ILE	N-CA	-6.05	1.34	1.46
1	A	234	ARG	NE-CZ	-5.35	1.26	1.33

All (81) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	174	ARG	CD-NE-CZ	33.46	170.45	123.60
1	A	40	ARG	NE-CZ-NH2	27.92	134.26	120.30
1	A	234	ARG	NE-CZ-NH1	-23.47	108.56	120.30
1	A	211	GLY	C-N-CA	22.82	178.74	121.70
1	A	40	ARG	NE-CZ-NH1	-20.66	109.97	120.30
1	A	156	ASP	C-N-CA	17.69	159.44	122.30
1	A	234	ARG	NE-CZ-NH2	16.67	128.64	120.30
1	A	261	ARG	NE-CZ-NH2	14.21	127.40	120.30
1	A	3	LEU	CA-C-O	13.54	148.53	120.10
1	A	3	LEU	C-N-CA	13.06	154.36	121.70
1	A	243	ARG	NE-CZ-NH1	-12.45	114.07	120.30
1	A	156	ASP	CA-C-O	10.73	142.64	120.10
1	A	248	ARG	NE-CZ-NH2	10.15	125.37	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	210	ASP	CB-CG-OD1	9.23	126.60	118.30
1	A	321	ALA	CA-C-O	-9.12	100.95	120.10
1	A	3	LEU	CB-CA-C	8.57	126.49	110.20
1	A	285	SER	N-CA-CB	8.24	122.86	110.50
1	A	3	LEU	CA-C-N	-8.20	99.15	117.20
1	A	287	ARG	NE-CZ-NH1	8.18	124.39	120.30
1	A	39	ARG	NE-CZ-NH1	-8.12	116.24	120.30
1	A	248	ARG	CD-NE-CZ	8.04	134.86	123.60
1	A	156	ASP	O-C-N	-7.96	109.67	123.20
1	A	248	ARG	CG-CD-NE	7.89	128.38	111.80
1	A	154	ASP	CB-CG-OD1	7.86	125.37	118.30
1	A	284	ASP	CA-CB-CG	7.81	130.58	113.40
1	A	344	ARG	NE-CZ-NH1	7.59	124.09	120.30
1	A	174	ARG	NE-CZ-NH2	7.55	124.08	120.30
1	A	183	TYR	CB-CG-CD2	-7.42	116.55	121.00
1	A	105	ASP	CB-CG-OD2	7.33	124.90	118.30
1	A	183	TYR	CB-CG-CD1	7.28	125.37	121.00
1	A	3	LEU	O-C-N	-7.25	111.10	122.70
1	A	157	GLY	CA-C-O	7.23	133.62	120.60
1	A	304	ARG	CG-CD-NE	7.18	126.89	111.80
1	A	4	ASN	CA-CB-CG	7.18	129.19	113.40
1	A	321	ALA	O-C-N	7.15	134.68	121.10
1	A	204	ASP	CB-CG-OD2	6.98	124.58	118.30
1	A	174	ARG	CG-CD-NE	6.91	126.32	111.80
1	A	344	ARG	NE-CZ-NH2	-6.87	116.86	120.30
1	A	156	ASP	CA-CB-CG	-6.85	98.32	113.40
1	A	154	ASP	CA-C-N	-6.83	102.17	117.20
1	A	157	GLY	N-CA-C	6.83	130.18	113.10
1	A	322	PRO	CA-N-CD	-6.81	101.97	111.50
1	A	175	ASP	CB-CG-OD2	6.77	124.40	118.30
1	A	322	PRO	N-CD-CG	6.73	113.30	103.20
1	A	234	ARG	CD-NE-CZ	6.43	132.60	123.60
1	A	154	ASP	CA-C-O	6.38	133.50	120.10
1	A	126	GLN	CG-CD-OE1	6.21	134.01	121.60
1	A	211	GLY	CA-C-O	6.18	131.73	120.60
1	A	292	VAL	N-CA-CB	-6.18	97.91	111.50
1	A	262	PHE	CB-CG-CD1	-6.04	116.57	120.80
1	A	305	MET	N-CA-CB	-5.95	99.89	110.60
1	A	155	ALA	N-CA-CB	5.94	118.42	110.10
1	A	120	ASP	CB-CG-OD2	-5.93	112.96	118.30
1	A	305	MET	CA-CB-CG	5.92	123.36	113.30
1	A	243	ARG	NH1-CZ-NH2	5.89	125.88	119.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	154	ASP	N-CA-CB	5.82	121.08	110.60
1	A	157	GLY	C-N-CA	5.81	136.22	121.70
1	A	153	LEU	CA-C-N	-5.73	104.60	117.20
1	A	322	PRO	N-CA-CB	5.71	110.16	103.30
1	A	37	ASP	CB-CG-OD1	5.58	123.32	118.30
1	A	191	ASN	CB-CA-C	-5.57	99.25	110.40
1	A	136	TYR	CB-CG-CD2	-5.50	117.70	121.00
1	A	213	LYS	CA-C-N	-5.49	105.12	117.20
1	A	292	VAL	CA-CB-CG1	5.45	119.07	110.90
1	A	4	ASN	CB-CG-OD1	5.43	132.46	121.60
1	A	40	ARG	CD-NE-CZ	-5.32	116.15	123.60
1	A	346	LEU	CA-CB-CG	5.32	127.54	115.30
1	A	261	ARG	NH1-CZ-NH2	-5.32	113.55	119.40
1	A	3	LEU	N-CA-CB	-5.31	99.78	110.40
1	A	323	LEU	CA-CB-CG	5.31	127.52	115.30
1	A	303	GLY	CA-C-N	5.31	128.88	117.20
1	A	185	GLU	OE1-CD-OE2	-5.27	116.98	123.30
1	A	294	LYS	N-CA-CB	5.26	120.07	110.60
1	A	262	PHE	CB-CG-CD2	5.23	124.46	120.80
1	A	211	GLY	N-CA-C	5.19	126.08	113.10
1	A	295	ASP	CB-CG-OD1	5.17	122.95	118.30
1	A	302	ARG	CD-NE-CZ	5.13	130.78	123.60
1	A	154	ASP	CA-CB-CG	5.12	124.66	113.40
1	A	248	ARG	CA-CB-CG	5.05	124.52	113.40
1	A	255	LEU	CA-CB-CG	5.01	126.82	115.30
1	A	155	ALA	N-CA-C	-5.00	97.50	111.00

There are no chirality outliers.

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	153	LEU	Mainchain
1	A	180	TYR	Mainchain
1	A	211	GLY	Peptide
1	A	27	SER	Mainchain
1	A	315	ASN	Mainchain
1	A	321	ALA	Mainchain,Peptide

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	2606	0	2605	64	0
2	A	145	0	0	5	0
All	All	2751	0	2605	64	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 12.

All (64) 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:294:LYS:HA	1:A:294:LYS:HE2	1.60	0.80
1:A:207:LEU:HD11	1:A:253:LYS:HG3	1.65	0.77
1:A:217:THR:HG22	1:A:220:ALA:H	1.48	0.77
1:A:245:PHE:O	1:A:248:ARG:HG3	1.90	0.71
1:A:278:GLU:HG2	1:A:314:LEU:HD11	1.75	0.68
1:A:234:ARG:NH1	2:A:2101:HOH:O	2.28	0.65
1:A:200:GLY:HA3	1:A:249:GLU:OE2	1.98	0.64
1:A:354:GLU:HG3	1:A:356:ASN:O	1.99	0.62
1:A:14:GLN:NE2	1:A:14:GLN:HA	2.14	0.62
1:A:189:THR:HG22	1:A:194:ARG:HG3	1.84	0.59
1:A:266:VAL:HG11	1:A:305:MET:HG2	1.86	0.58
1:A:109:GLN:NE2	1:A:195:GLN:HB3	2.19	0.57
1:A:217:THR:HG22	1:A:220:ALA:N	2.18	0.57
1:A:3:LEU:N	1:A:4:ASN:OD1	2.37	0.56
1:A:213:LYS:HE2	2:A:2082:HOH:O	2.04	0.56
1:A:47:LYS:HE2	1:A:110:SER:O	2.05	0.56
1:A:40:ARG:NH1	1:A:40:ARG:HB3	2.21	0.56
1:A:109:GLN:HE22	1:A:195:GLN:HB3	1.70	0.56
1:A:223:ASN:HD22	1:A:240:MET:HG2	1.72	0.56
1:A:40:ARG:NH1	2:A:2029:HOH:O	2.28	0.55
1:A:31:LEU:HD21	1:A:299:THR:HG21	1.89	0.54
1:A:92:LYS:O	1:A:95:MET:HG2	2.07	0.54
1:A:292:VAL:HG13	1:A:294:LYS:O	2.11	0.50
1:A:290:LEU:HD13	1:A:346:LEU:HD13	1.93	0.50
1:A:20:TYR:HA	1:A:238:ALA:O	2.12	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:158:GLN:O	1:A:158:GLN:HG2	2.12	0.50
1:A:20:TYR:CE2	1:A:34:GLN:HB3	2.48	0.49
1:A:264:GLU:HG2	1:A:302:ARG:HA	1.94	0.48
1:A:219:LYS:O	1:A:219:LYS:HG2	2.14	0.48
1:A:108:LEU:HD22	1:A:188:PHE:CD1	2.49	0.47
1:A:14:GLN:HA	1:A:14:GLN:HE21	1.78	0.47
1:A:304:ARG:HH11	1:A:304:ARG:HG2	1.79	0.47
1:A:8:MET:HG2	1:A:9:ILE:N	2.28	0.46
1:A:33:GLU:HG2	2:A:2020:HOH:O	2.14	0.46
1:A:107:ASN:O	1:A:213:LYS:NZ	2.42	0.46
1:A:304:ARG:HH11	1:A:304:ARG:CG	2.28	0.46
1:A:16:ASP:OD1	1:A:243:ARG:NH1	2.44	0.46
1:A:290:LEU:HD13	1:A:346:LEU:CD1	2.46	0.46
1:A:64:LYS:HZ3	1:A:66:THR:CG2	2.29	0.46
1:A:163:ARG:HD3	2:A:2069:HOH:O	2.16	0.46
1:A:152:GLY:HA2	1:A:158:GLN:OE1	2.16	0.45
1:A:40:ARG:CB	1:A:40:ARG:HH11	2.30	0.45
1:A:271:VAL:HG22	1:A:295:ASP:OD1	2.15	0.45
1:A:48:MET:HG3	1:A:213:LYS:HG3	1.98	0.45
1:A:283:GLY:HA2	1:A:355:GLY:H	1.81	0.45
1:A:266:VAL:HG23	1:A:268:PRO:HD3	1.99	0.44
1:A:189:THR:HG22	1:A:194:ARG:CG	2.46	0.44
1:A:24:ASP:HB3	1:A:27:SER:OG	2.18	0.44
1:A:106:ILE:HD11	1:A:115:CYS:HA	1.99	0.44
1:A:269:LEU:HD21	1:A:275:PHE:HB2	1.99	0.44
1:A:137:VAL:HG13	1:A:142:LEU:HB2	2.00	0.43
1:A:294:LYS:HD3	1:A:295:ASP:N	2.33	0.43
1:A:40:ARG:HB3	1:A:40:ARG:HH11	1.82	0.42
1:A:153:LEU:HD23	1:A:153:LEU:HA	1.80	0.42
1:A:294:LYS:CE	1:A:295:ASP:H	2.33	0.42
1:A:91:LEU:HD23	1:A:113:ASP:HB3	2.02	0.42
1:A:190:PHE:O	1:A:193:ILE:N	2.45	0.42
1:A:323:LEU:HG	1:A:348:VAL:HG21	2.01	0.42
1:A:336:LEU:O	1:A:339:LYS:HB2	2.21	0.41
1:A:294:LYS:HD3	1:A:295:ASP:H	1.84	0.41
1:A:309:LYS:HE3	1:A:309:LYS:HB2	1.90	0.41
1:A:333:ASN:OD1	1:A:343:GLN:HG2	2.20	0.41
1:A:91:LEU:HD11	1:A:97:VAL:HG21	2.03	0.41
1:A:263:PHE:O	1:A:302:ARG:NH2	2.53	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	333/363 (92%)	321 (96%)	9 (3%)	3 (1%)	17 20

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	4	ASN
1	A	157	GLY
1	A	212	ILE

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	281/302 (93%)	251 (89%)	30 (11%)	6 7

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	LEU
1	A	4	ASN
1	A	6	LYS
1	A	9	ILE
1	A	22	LEU
1	A	51	SER
1	A	66	THR
1	A	68	LEU

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Mol	Chain	Res	Type
1	A	156	ASP
1	A	158	GLN
1	A	160	SER
1	A	174	ARG
1	A	190	PHE
1	A	191	ASN
1	A	212	ILE
1	A	213	LYS
1	A	214	THR
1	A	217	THR
1	A	232	GLN
1	A	246	LYS
1	A	271	VAL
1	A	284	ASP
1	A	285	SER
1	A	292	VAL
1	A	294	LYS
1	A	304	ARG
1	A	305	MET
1	A	313	VAL
1	A	323	LEU
1	A	346	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	4	ASN
1	A	14	GLN
1	A	109	GLN
1	A	151	HIS
1	A	223	ASN
1	A	232	GLN
1	A	267	ASN

5.3.3 RNA

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 (i)

There are no ligands in this entry.

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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.