



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 12:33 AM UTC

PDB ID : 1DT5 / pdb_00001dt5
Title : THE STRUCTURAL ORIGINS OF INTERFACIAL ACTIVATION IN
THERMOMYCES (HUMICOLA) LANUGINOSA LIPASE
Authors : Brozozowski, A.M.; Savage, H.
Deposited on : 2000-01-11
Resolution : 2.40 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 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 : 4-5-2 with Phenix2.0
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

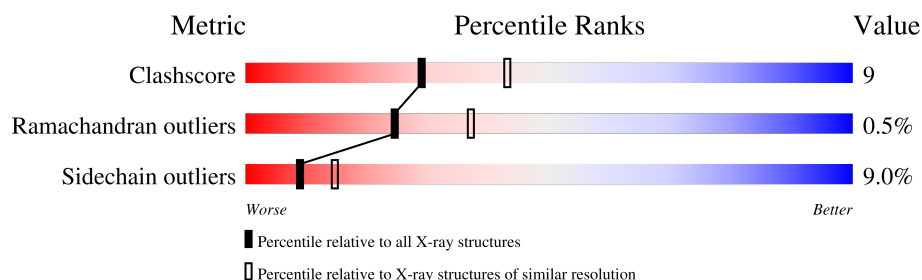
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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))
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (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 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	269	69% 23% 7% .
1	B	269	70% 23% 6% .
1	C	269	74% 19% 6% .
1	D	269	70% 20% 7% .
1	E	269	71% 22% 6% .
1	F	269	68% 27% . .
1	G	269	67% 27% . .
1	H	269	71% 23% 5% .

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 17081 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 LIPASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	269	Total 2071	C 1303	N 359	O 403	S 6	0	0	0
1	B	269	Total 2071	C 1303	N 359	O 403	S 6	0	0	0
1	C	269	Total 2071	C 1303	N 359	O 403	S 6	0	0	0
1	D	269	Total 2071	C 1303	N 359	O 403	S 6	0	0	0
1	E	269	Total 2071	C 1303	N 359	O 403	S 6	0	0	0
1	F	269	Total 2071	C 1303	N 359	O 403	S 6	0	0	0
1	G	269	Total 2071	C 1303	N 359	O 403	S 6	0	0	0
1	H	269	Total 2071	C 1303	N 359	O 403	S 6	0	0	0

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	90	Total 90	O 90	0	0
2	B	102	Total 102	O 102	0	0
2	C	64	Total 64	O 64	0	0
2	D	68	Total 68	O 68	0	0
2	E	57	Total 57	O 57	0	0
2	F	51	Total 51	O 51	0	0

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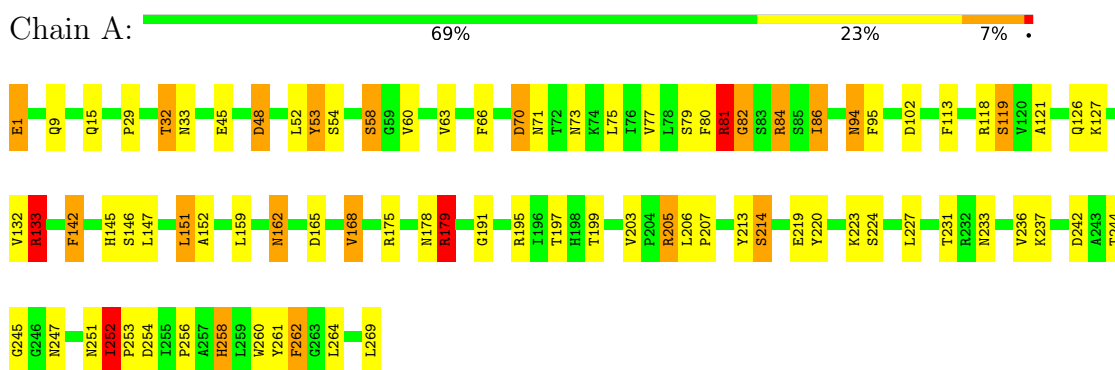
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	G	30	Total 30	O 30	0	0
2	H	51	Total 51	O 51	0	0

3 Residue-property plots

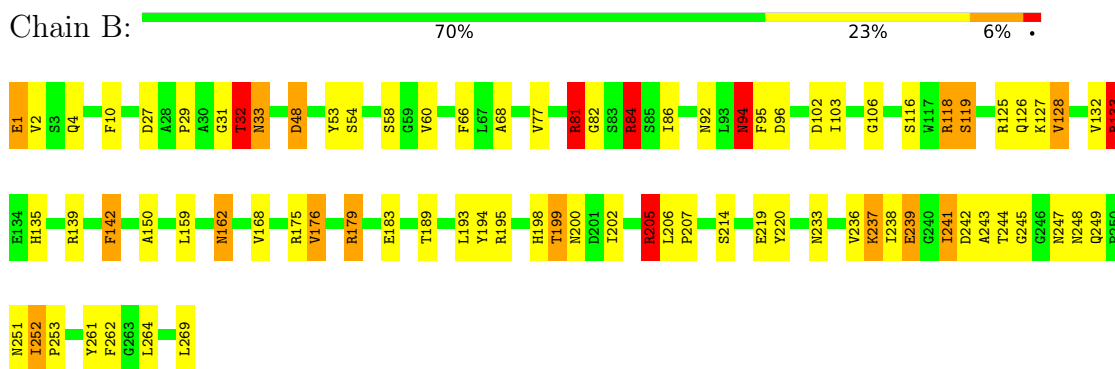
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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.

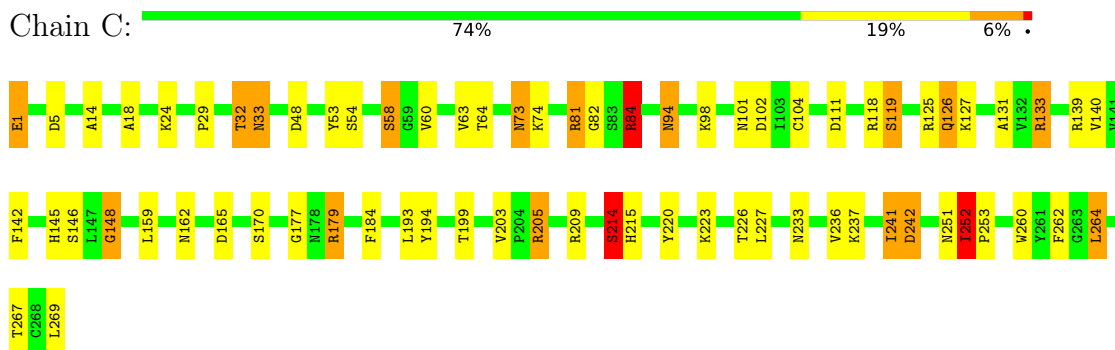
• Molecule 1: LIPASE



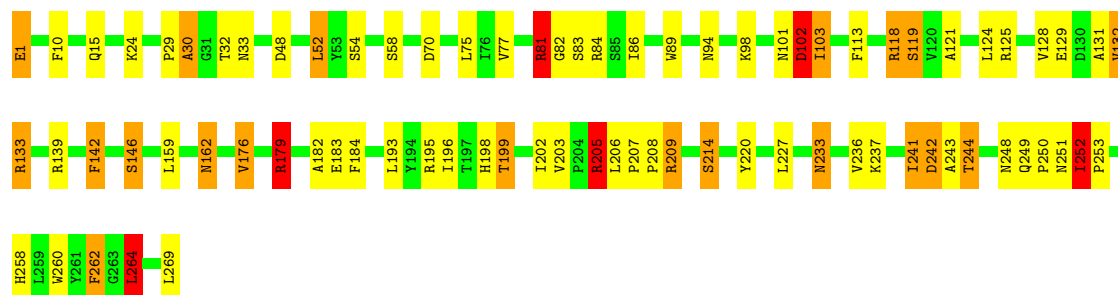
• Molecule 1: LIPASE



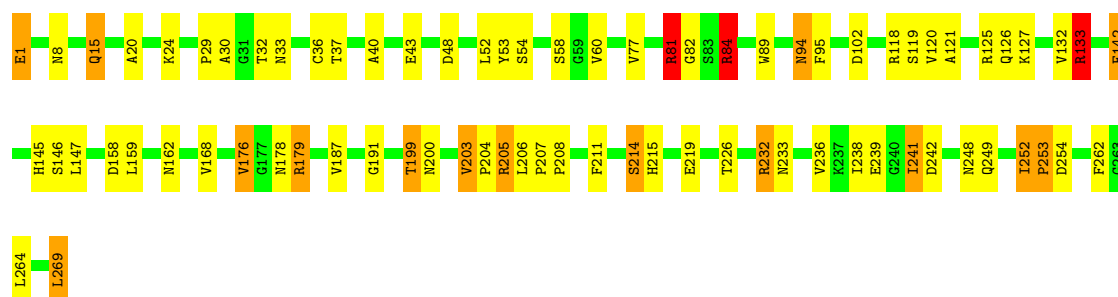
• Molecule 1: LIPASE



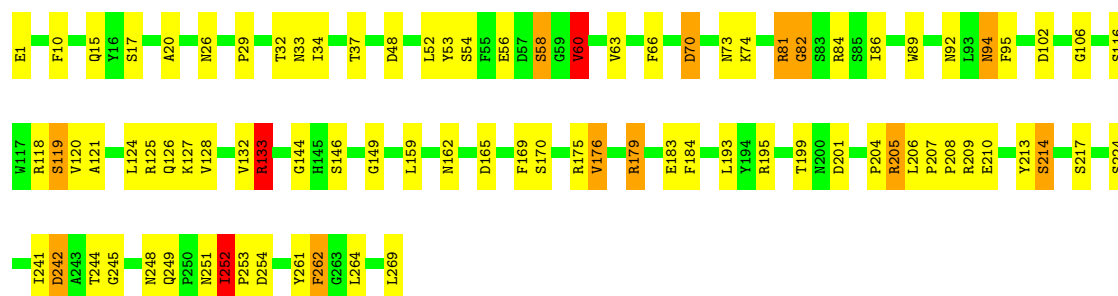
• Molecule 1: LIPASE

Chain D: 

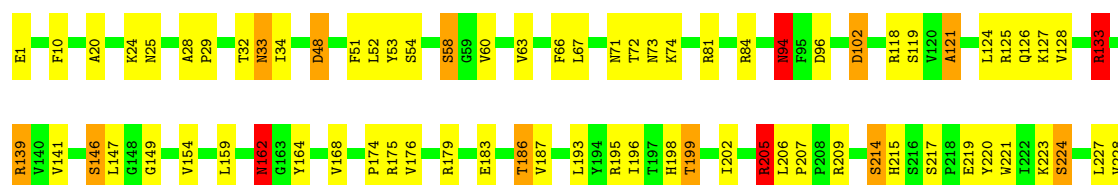
• Molecule 1: LIPASE

Chain E: 

• Molecule 1: LIPASE

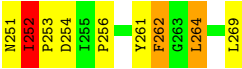
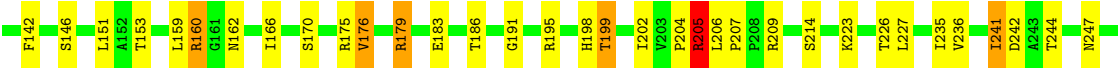
Chain F: 

• Molecule 1: LIPASE

Chain G: 



● Molecule 1: LIPASE



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	85.44Å 162.88Å 86.72Å 90.00° 98.45° 90.00°	Depositor
Resolution (Å)	20.00 – 2.40	Depositor
% Data completeness (in resolution range)	98.4 (20.00-2.40)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC	Depositor
R, R_{free}	0.244 , 0.315	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	17081	wwPDB-VP
Average B, all atoms (Å ²)	57.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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	2/2121 (0.1%)	1.97	71/2887 (2.5%)
1	B	0.87	2/2121 (0.1%)	2.04	61/2887 (2.1%)
1	C	0.71	0/2121	1.84	44/2887 (1.5%)
1	D	0.75	1/2121 (0.0%)	1.89	63/2887 (2.2%)
1	E	0.67	0/2121	1.77	35/2887 (1.2%)
1	F	0.71	0/2121	1.82	48/2887 (1.7%)
1	G	0.63	0/2121	1.70	30/2887 (1.0%)
1	H	0.68	0/2121	1.78	38/2887 (1.3%)
All	All	0.74	5/16968 (0.0%)	1.85	390/23096 (1.7%)

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	8
1	B	0	3
1	C	0	6
1	D	0	5
1	E	0	4
1	F	0	4
1	G	0	7
1	H	0	2
All	All	0	39

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	81	ARG	CD-NE	-6.67	1.36	1.46
1	A	245	GLY	N-CA	5.61	1.53	1.45
1	B	205	ARG	CD-NE	-5.49	1.38	1.46
1	D	205	ARG	CD-NE	-5.42	1.38	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	205	ARG	CD-NE	-5.05	1.39	1.46

The worst 5 of 390 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	205	ARG	CD-NE-CZ	24.60	158.84	124.40
1	H	205	ARG	CD-NE-CZ	23.46	157.25	124.40
1	D	205	ARG	CD-NE-CZ	20.63	153.28	124.40
1	A	205	ARG	CD-NE-CZ	19.73	152.03	124.40
1	B	48	ASP	CA-CB-CG	16.29	128.89	112.60

There are no chirality outliers.

5 of 39 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	147	LEU	Mainchain
1	A	15	GLN	Mainchain
1	A	151	LEU	Mainchain
1	A	168	VAL	Mainchain
1	A	45	GLU	Mainchain

5.2 Too-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 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	2071	0	1965	32	0
1	B	2071	0	1965	31	0
1	C	2071	0	1965	26	0
1	D	2071	0	1965	44	1
1	E	2071	0	1965	35	1
1	F	2071	0	1965	33	0
1	G	2071	0	1965	50	0
1	H	2071	0	1965	39	0
2	A	90	0	0	5	1
2	B	102	0	0	6	1
2	C	64	0	0	4	0
2	D	68	0	0	10	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	57	0	0	6	0
2	F	51	0	0	5	0
2	G	30	0	0	9	0
2	H	51	0	0	6	0
All	All	17081	0	15720	281	2

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 281 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:231:THR:HG21	1:G:125:ARG:HH12	1.21	1.02
1:F:252:ILE:HD12	1:F:253:PRO:HD2	1.50	0.94
1:D:252:ILE:HD12	1:D:253:PRO:HD2	1.52	0.92
1:H:252:ILE:HD12	1:H:253:PRO:HD2	1.51	0.92
1:H:179:ARG:NH2	2:H:270:HOH:O	2.03	0.91

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:311:HOH:O	2:B:361:HOH:O[2_546]	1.97	0.23
1:D:102:ASP:O	1:E:232:ARG:NH2[2_657]	2.13	0.07

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	267/269 (99%)	256 (96%)	10 (4%)	1 (0%)	30 43
1	B	267/269 (99%)	257 (96%)	9 (3%)	1 (0%)	30 43

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	267/269 (99%)	255 (96%)	11 (4%)	1 (0%)	30	43
1	D	267/269 (99%)	256 (96%)	8 (3%)	3 (1%)	11	18
1	E	267/269 (99%)	254 (95%)	12 (4%)	1 (0%)	30	43
1	F	267/269 (99%)	256 (96%)	10 (4%)	1 (0%)	30	43
1	G	267/269 (99%)	256 (96%)	10 (4%)	1 (0%)	30	43
1	H	267/269 (99%)	257 (96%)	9 (3%)	1 (0%)	30	43
All	All	2136/2152 (99%)	2047 (96%)	79 (4%)	10 (0%)	24	37

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	102	ASP
1	A	199	THR
1	E	199	THR
1	H	199	THR
1	C	199	THR

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	220/220 (100%)	201 (91%)	19 (9%)	10	16
1	B	220/220 (100%)	200 (91%)	20 (9%)	9	14
1	C	220/220 (100%)	200 (91%)	20 (9%)	9	14
1	D	220/220 (100%)	197 (90%)	23 (10%)	6	10
1	E	220/220 (100%)	198 (90%)	22 (10%)	7	11
1	F	220/220 (100%)	200 (91%)	20 (9%)	9	14
1	G	220/220 (100%)	202 (92%)	18 (8%)	10	18
1	H	220/220 (100%)	203 (92%)	17 (8%)	12	20
All	All	1760/1760 (100%)	1601 (91%)	159 (9%)	9	15

5 of 159 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	F	146	SER
1	H	33	ASN
1	F	205	ARG
1	G	102	ASP
1	H	133	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 22 such sidechains are listed below:

Mol	Chain	Res	Type
1	F	71	ASN
1	G	88	ASN
1	G	33	ASN
1	G	126	GLN
1	C	33	ASN

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 oligosaccharides 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 ⓘ

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.