Electronic Supplementary Material (ESI) for Soft Matter.

Liquid Crystal Droplet Design by using Pseudopeptidic Bottlebrush Polymer Additives

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Table S1: Surface free energy parameters (mN/m) of the usesd liquids.

Liquid	γ_{lv}^{TOT}	γ_{lv}^{LW}	γ_{lv}^{AB}	γ_{lv}^{+}	γ_{lv}^{-}
Water	72.8	21.8	51	25.5	25.5
Formamide	58	39	19	2.28	39.6
Diiodomethane	50.8	50.8	0	0.72	0

Table S2: Molecular weight distribution of polymers as obtained from GPC using THF as eluent.

Polymer	**Mn (Da)**	**Mw (Da)**	**PDI**
PFO	31252	44735	1.43
PFH	36038	51509	1.43
PEO	30766	48409	1.57
PEH	26197	36519	1.39

Table S3: Phase transition temperature of the prepared PDLC samples.

Temperature	**PFO6**	**PFO5**	**PFO4**	**PEO6**	**PEO5**	**PEO4**
Heating (℃)	31.72	32.53	33.39	29.5	30.99	31.99
Cooling (℃)	31.43	32.22	33.11	29.37	30.8	31.73

Table . S4: Composition of pH solutions procured fromThermoFisher Scientific.

Buffer solution pH 4

Component	**CAS-No**	**Weight %**
Water	7732-18-5	<=99
1,2-benzenedicarboxylic acid, monopotassium salt	877-24-7	1.0
Mercuric chloride	7487-94-7	0.001

Buffer Solution, pH 6.8

Component	**CAS-No**	**Weight %**
Water	7732-18-5	84.33
1,3-propanediol, 2-amino-2-(hydroxymethyl)-hydrochloride,	1185-53-1	15.67

Buffer Solution pH 7

Chemical Name	**CAS-No**	**Percent**
Water	7732-18-5	99.0
Sodium hydroxide	1310-73-2	<1.0
Potassium phosphate monobasic	7778-77-0	<1.0

Buffer solution, pH 8.8

Component	**CAS-No**	**Weight %**
Water	7732-18-5	94.0
Tris(hydroxymethyl)aminomethane	77-86-1	6.0

Buffer solution, pH 10

Component	**CAS-No**	**Weight %**
Water	7732-18-5	99.0
Potassium chloride	7447-40-7	0.373
Boric acid (H_3BO_3)	10043-35-3	0.309
Sodium hydroxide	1310-73-2	0.175

Table S5: The composition of second set of pH solutions.

ThermoFisher Scientific

Buffer Solution, pH 4.00

Component	**CAS No**	**Weight %**
Water	7732-18-5	98.91
1,2-benzenedicarboxylic acid, monopotassium salt	877-24-7	1.0
Formaldehyde	50-00-0	0.05
Methyl alcohol	67-56-1	0.02
Fluorescein, 2',4',5',7'-tetraiodo, disodium salt	16423-68-0	0.02

Buffer solution pH 10 Component CAS No Weight %

Component	**CAS No**	**Weight %**
Water	7732-18-5	97.5
Ethylenediaminetetraacetic acid, disodium salt dihydrate	6381-92-6	1.0
Potassium carbonate	584-08-7	0.6
Potassium hydroxide	1310-58-3	0.5
Potassium Borate	12228-88-5	0.4

Prepared Buffer Solution

Buffer solution pH 7

Component	**CAS No**	**Weight %**
Water		98.46
Di-potassium hydrogen orthophosphate	7758-11-4	0.92
Potassium dihydrogen orthophosphate	7778-77-0	0.62

The formula used for calculating the buffer solution pH is[17]

$$pH = pKa + \log[A^-]/[HA] \quad (1)$$

HA – Weak Acid

A^- - Conjugated base

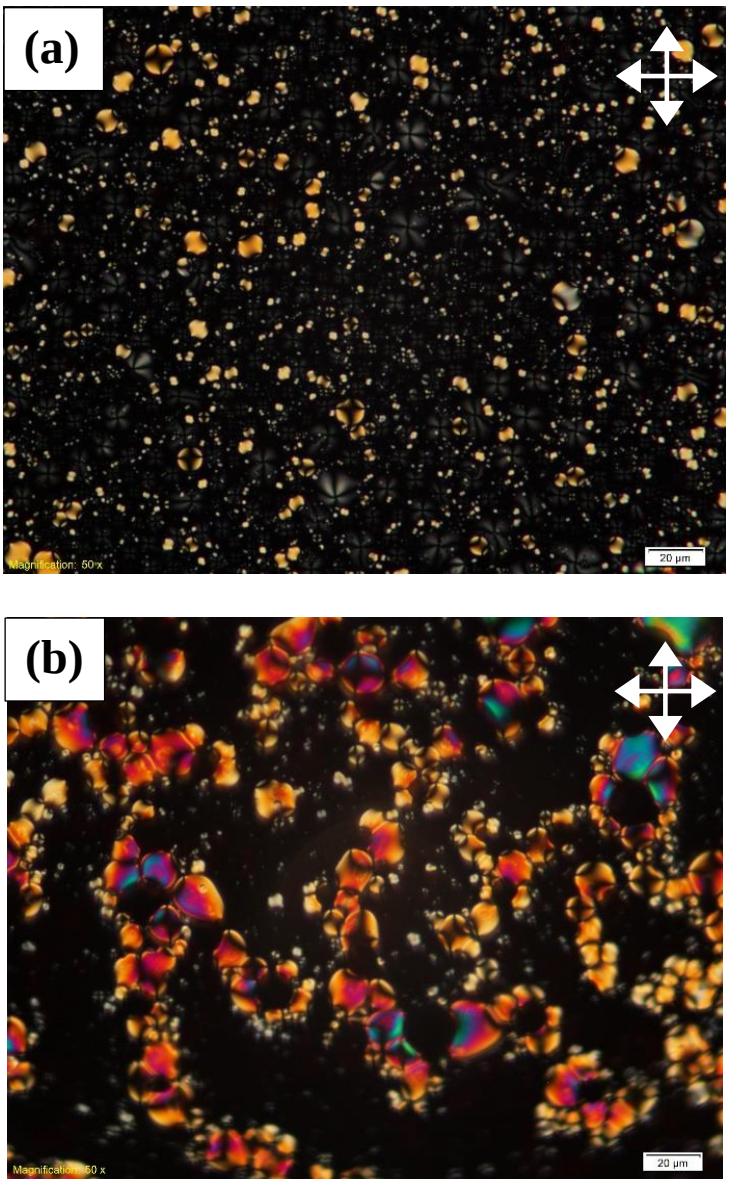


Fig. S1: POM image of PDLC sample prepared using 50 wt% **PEO** polymer and 50 wt% **5CB** having solution concentration (a) 5% w/v, and (b) 10% w/v.

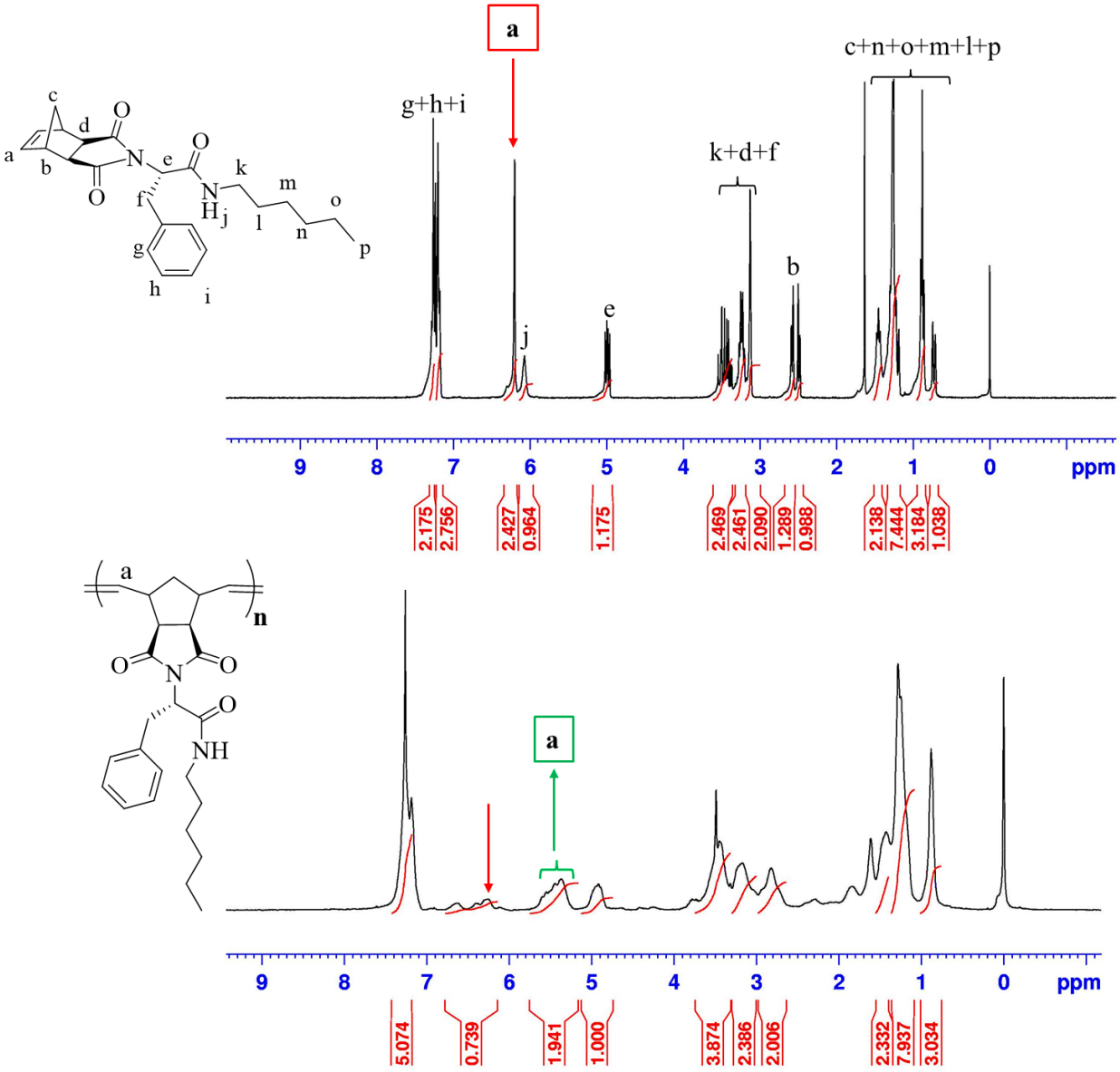


Fig. S2: ^{1}H NMR ($CDCl_3$, 300 MHz) spectral comparison of monomer **FH** and **PFH**. The olefinic protons are marked as '**a**'.

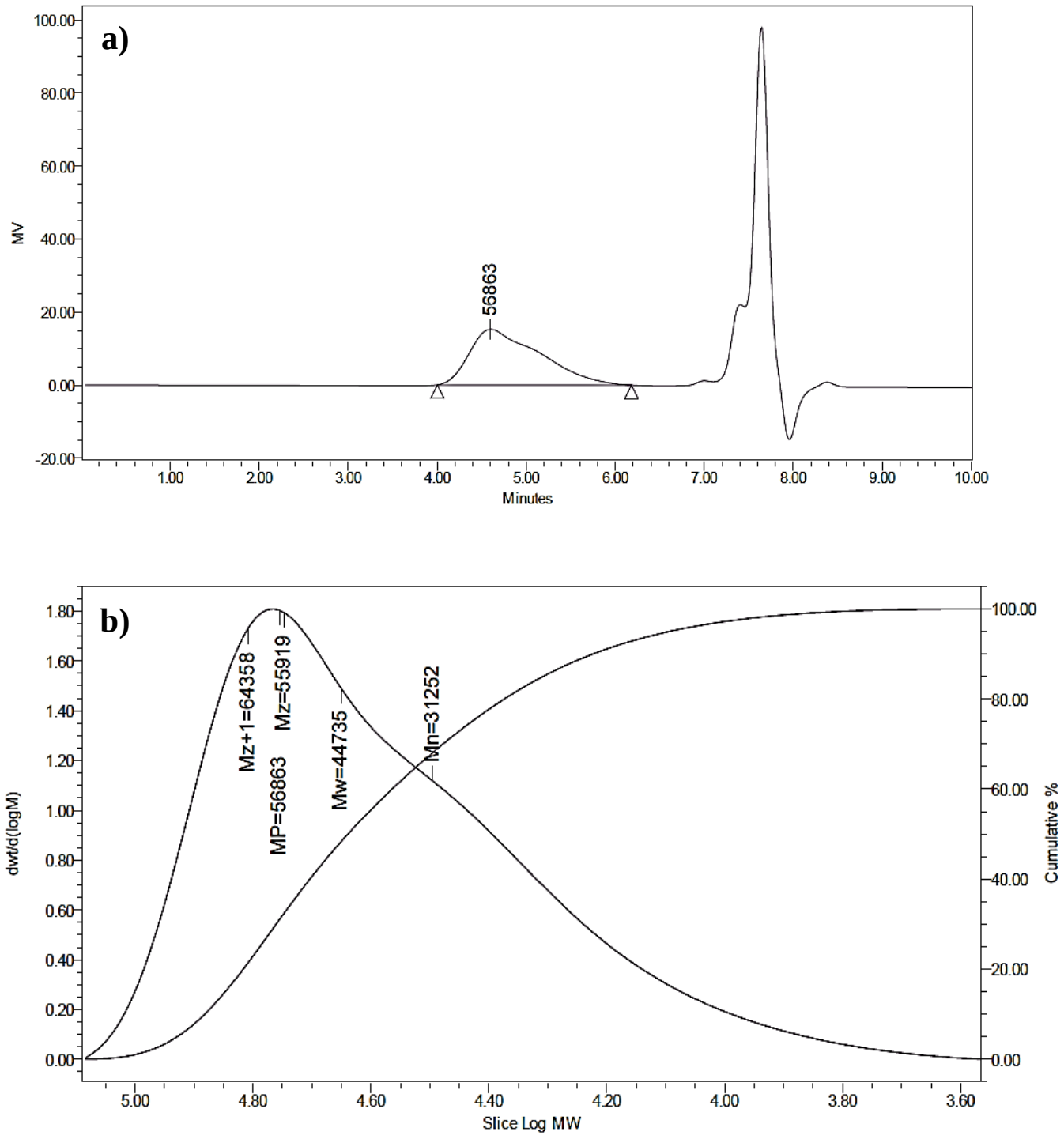


Fig S3: GPC profile of **PFO** a) complete chromatogram, b) expanded region of polymer peak.

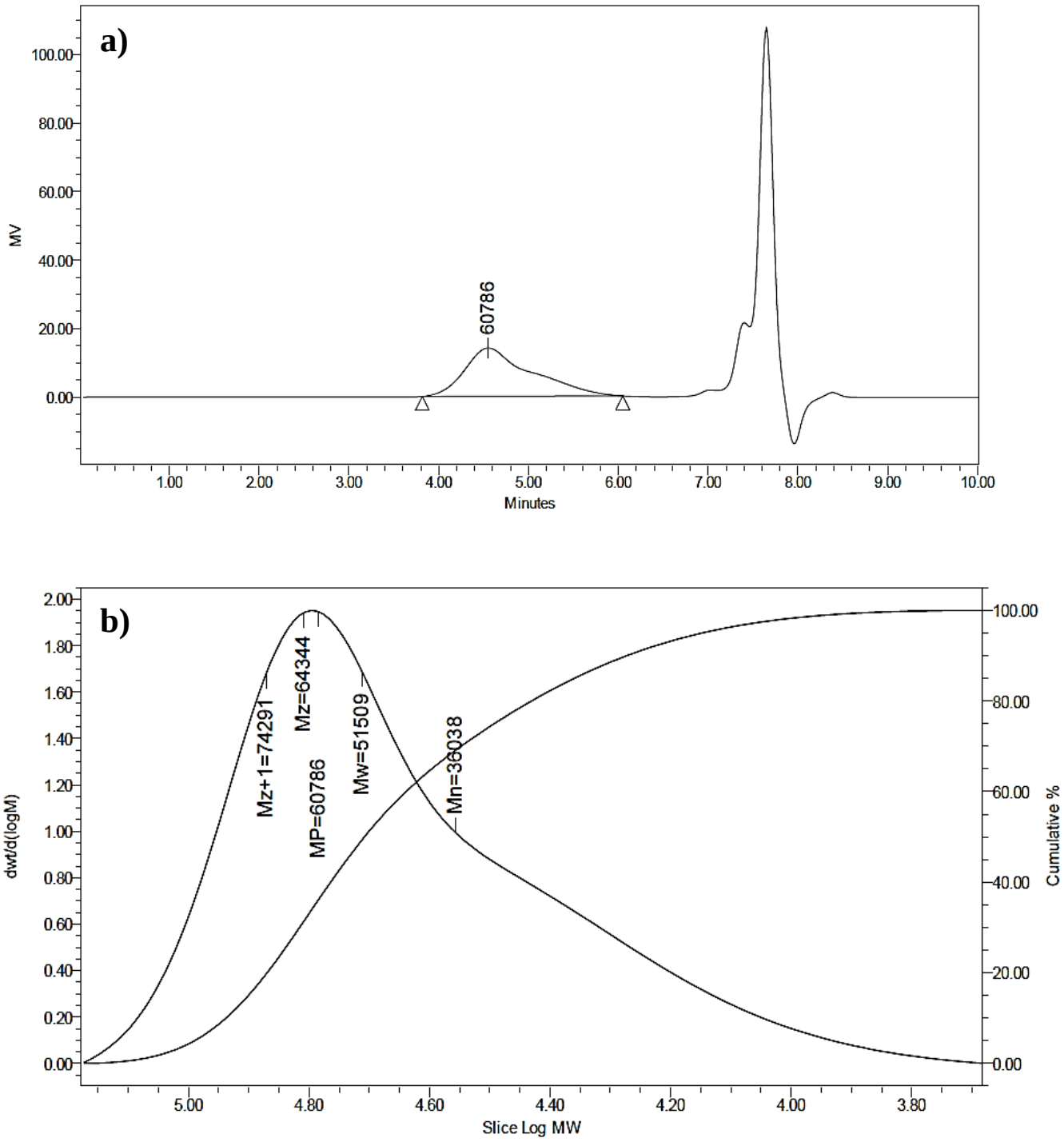


Fig S4: GPC profile of **PFH** a) complete chromatogram, b) expanded region of polymer peak.

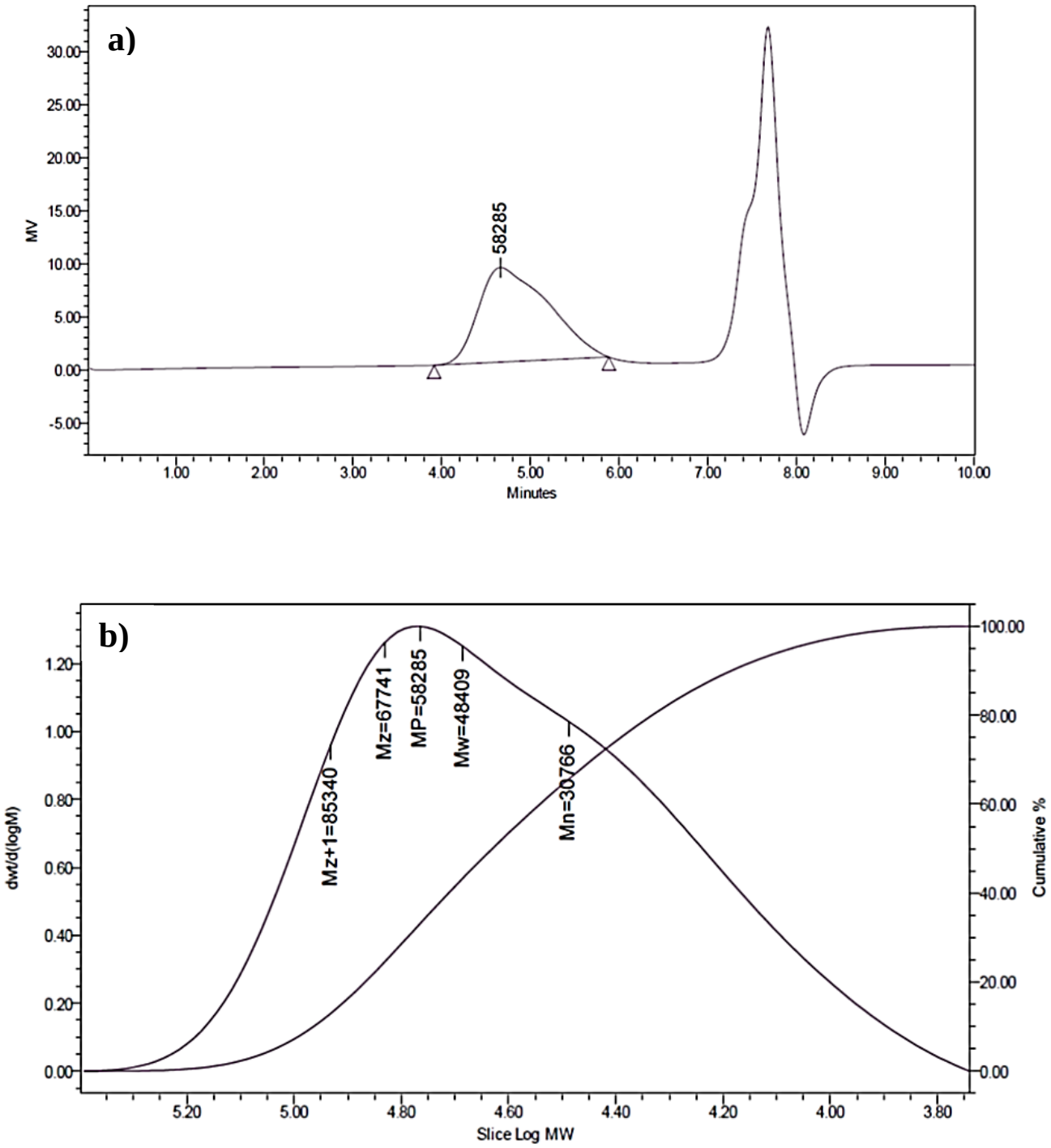


Fig S5: GPC profile of **PEO** a) complete chromatogram, and b) expanded region of polymer peak.

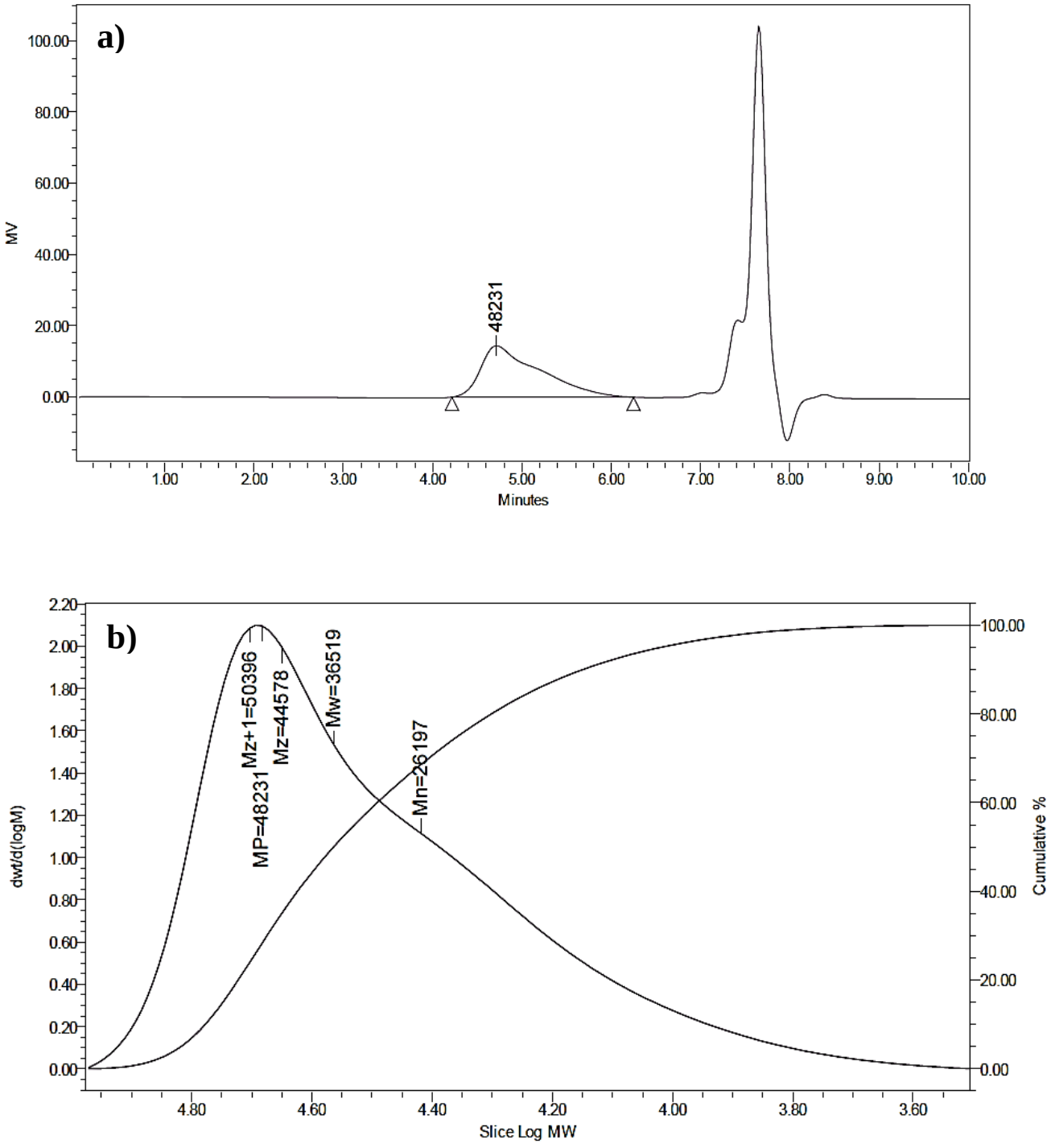


Fig S6: GPC profile of **PEH** a) complete chromatogram, and b) expanded region of polymer peak.

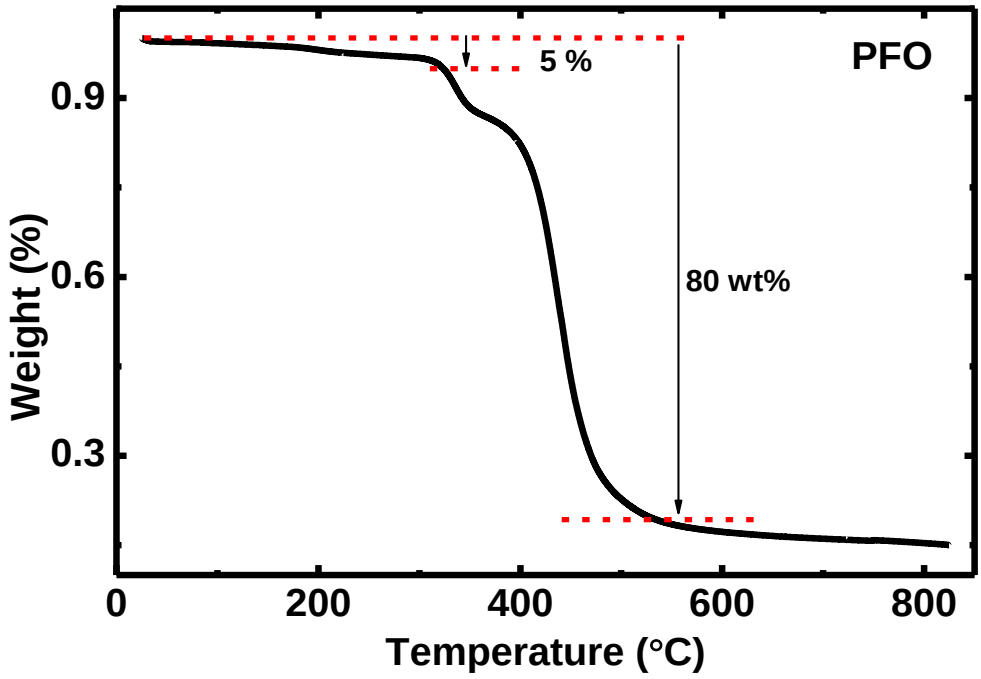


Fig. S7: Thermogravimetric analysis (TGA) profile of **PFO**.

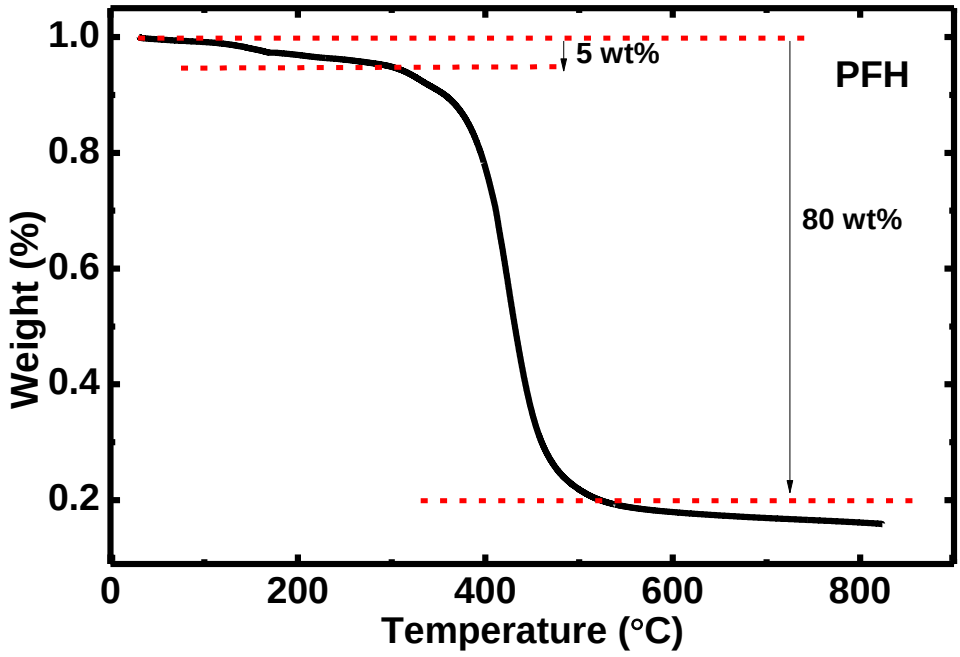


Fig. S8: TGA profile of **PFH**.

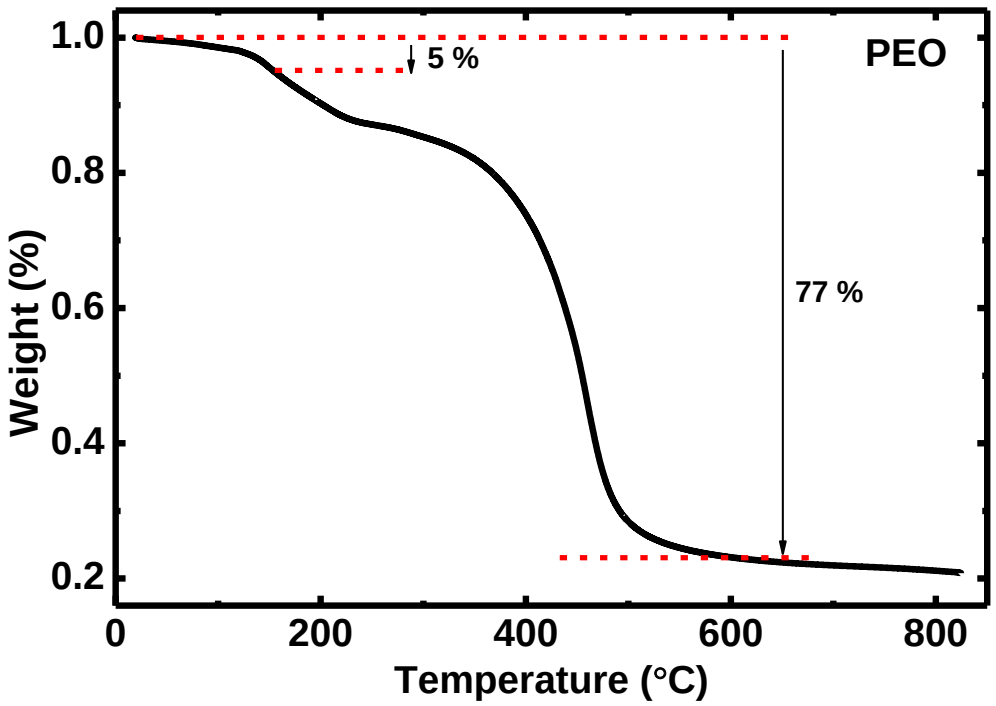


Fig. S9: TGA profile of **PEO**.

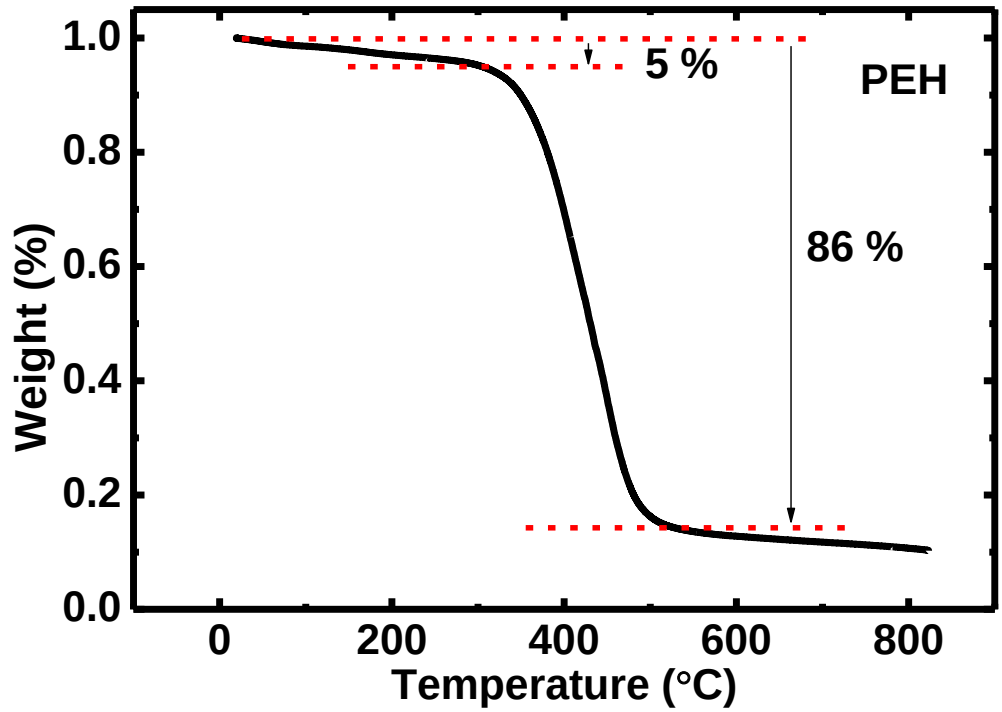


Fig. S10: TGA profile of **PEH**.

Fig. S11: POM image of pure **PFO** polymer film.

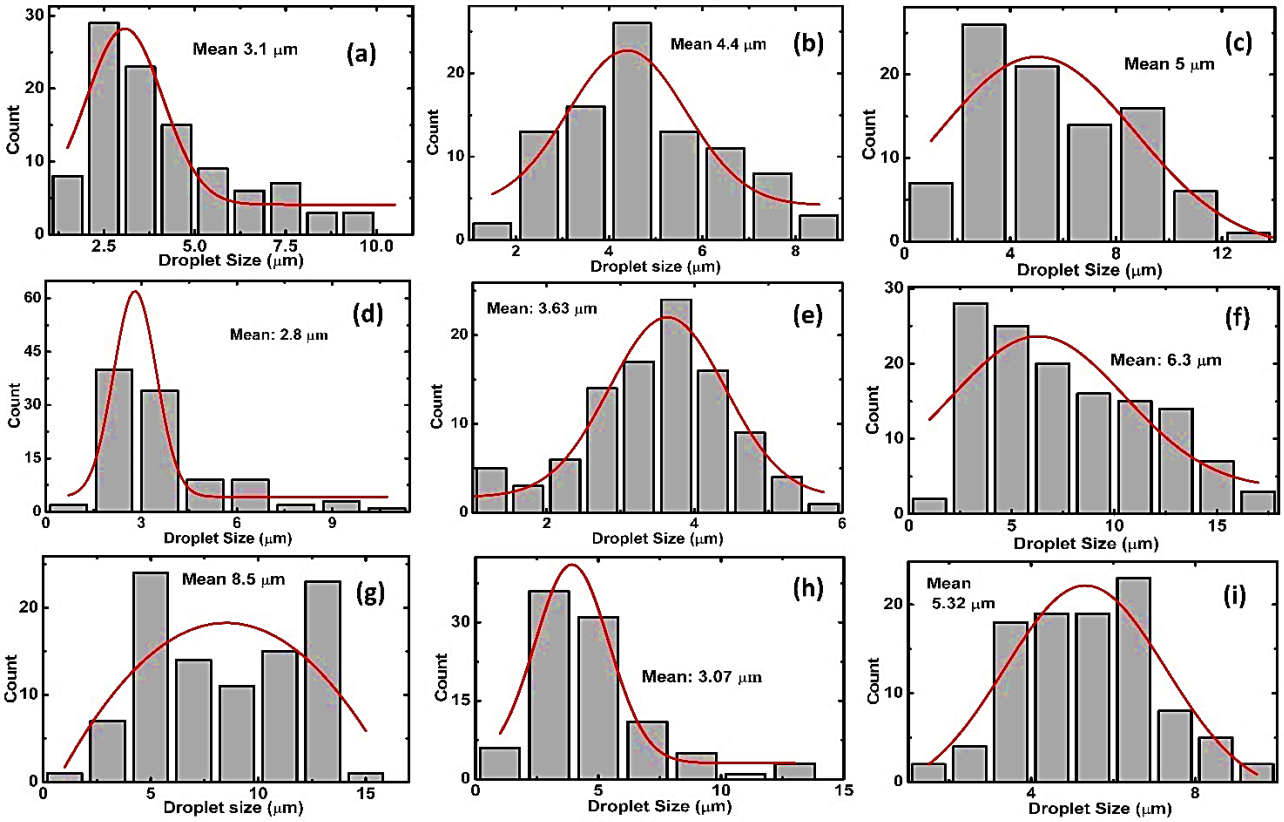


Fig. S12: Droplet size obtained using POM images of (a) **PFO6**, (b) **PFO5**, (c) **PFO4**, (d) **PFH5**, (e) **PEO6**, (f) **PEO5**, (g) **PEO4**, (h) **PEH5** and (i) **PEH4** samples.

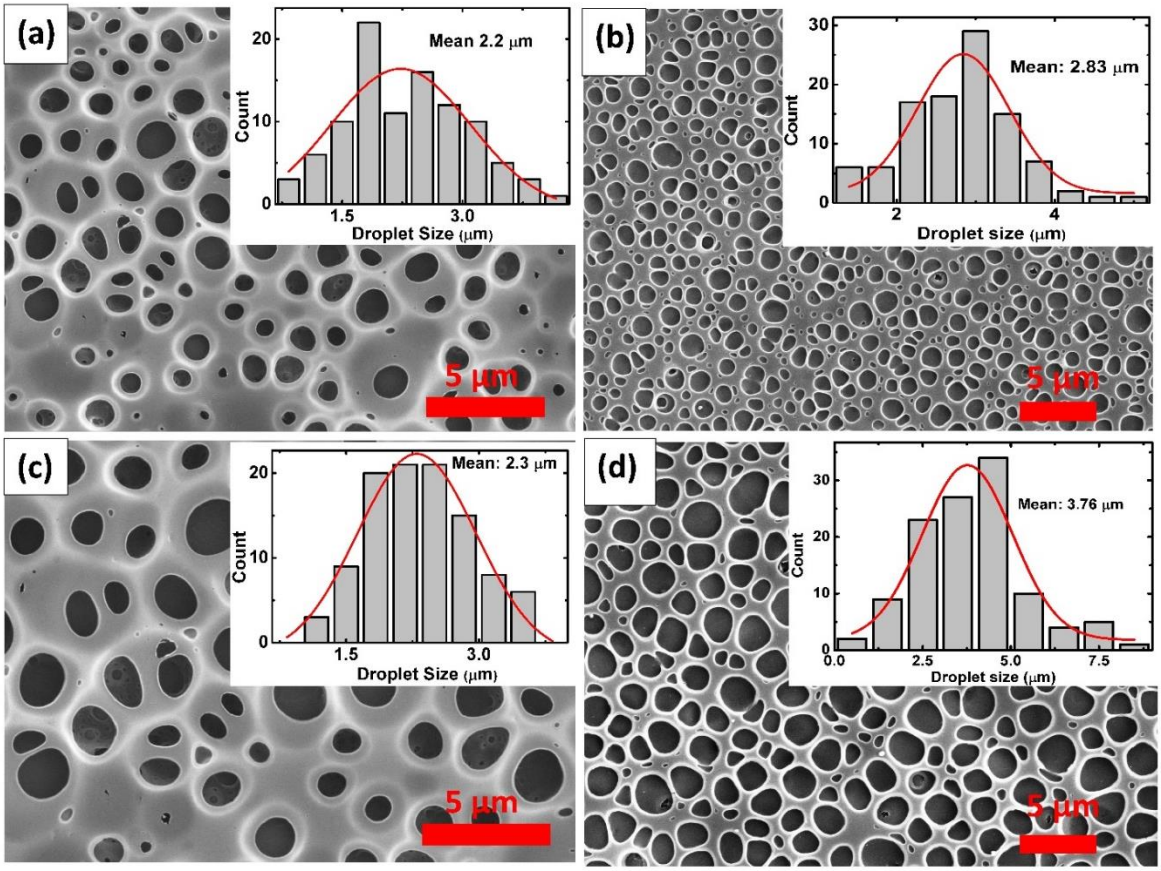


Fig. S13: FESEM images of (a) **PFH**, (b) **PFH5**, (c) **PEH**, and (d) **PEH5** sample.

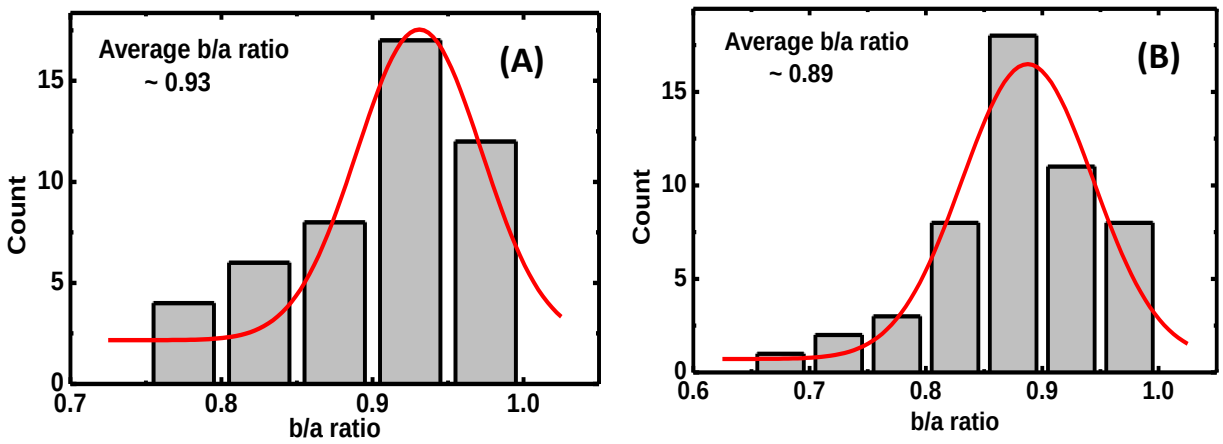


Fig. S14: The minor to major axis (b/a) ratio of the droplets calculated using FESEM images of (A) **PFO** and (B) **PEO** samples.

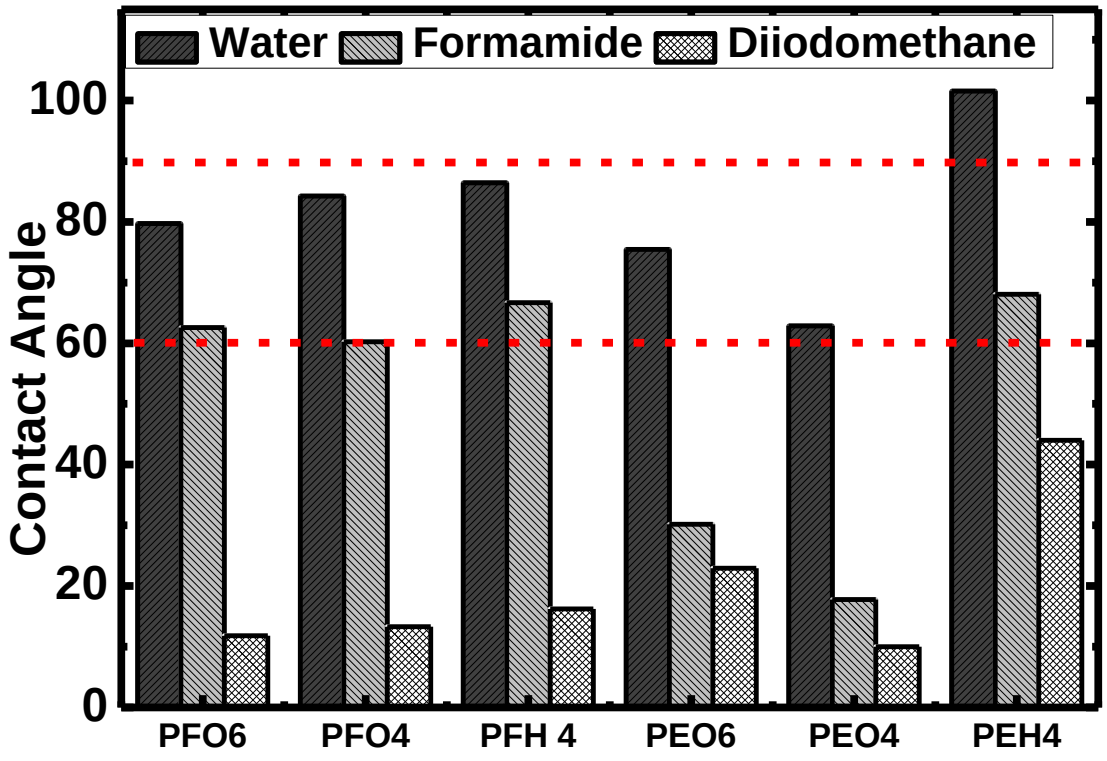


Fig. S15: Contact angle of **PFO6**, **PFO4**, **PFH4**, **PEO6**, **PEO4**, and **PEH4** PDLC sample with diiodomethane, formamide, and water.

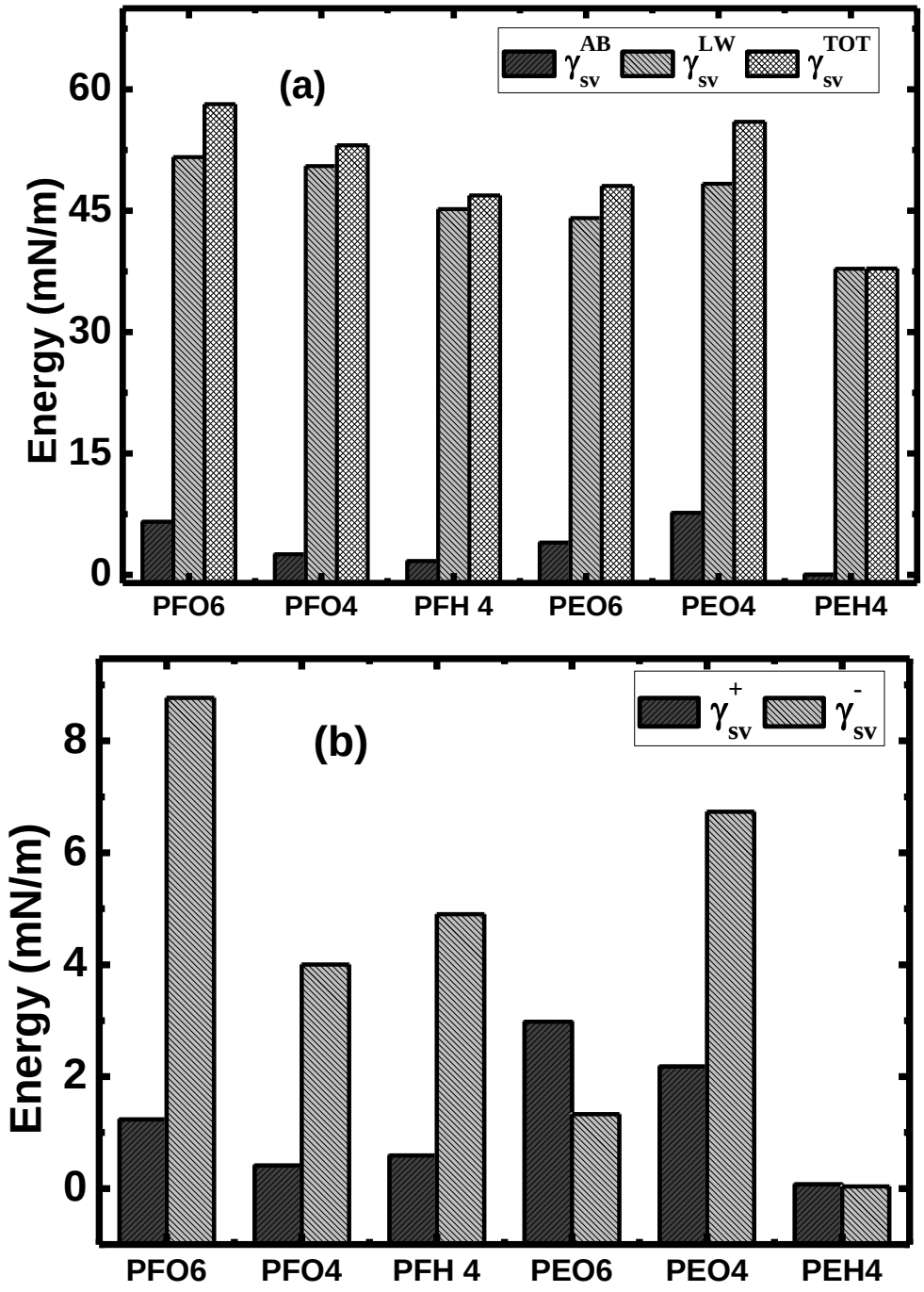


Fig. S16: Total surface free energy and its components of **PFO6**, **PFO4**, **PFH4**, **PEO6**, **PEO4**, and **PEH4** PDLC sample.

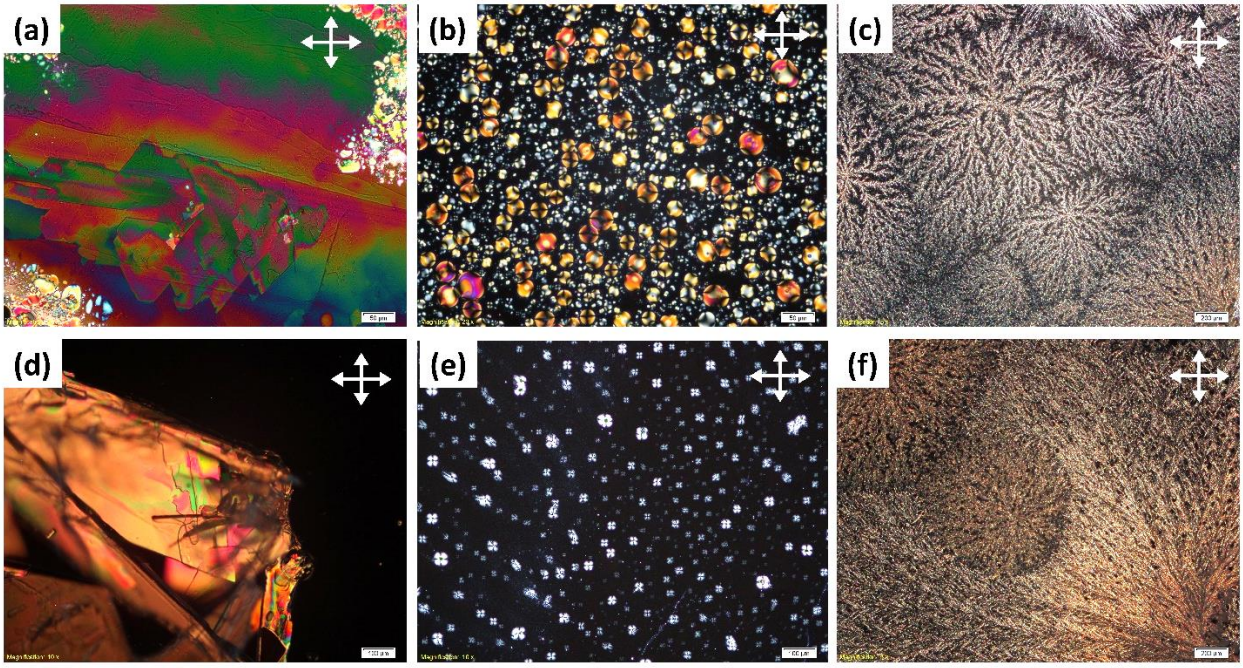


Fig. S17: POM images under crossed polarizers of **PFO5** and **PEO5** sample after the drop-casting solution of pH (table S5) (a, d) 4, (b, e) 7, and (c, f) 10.

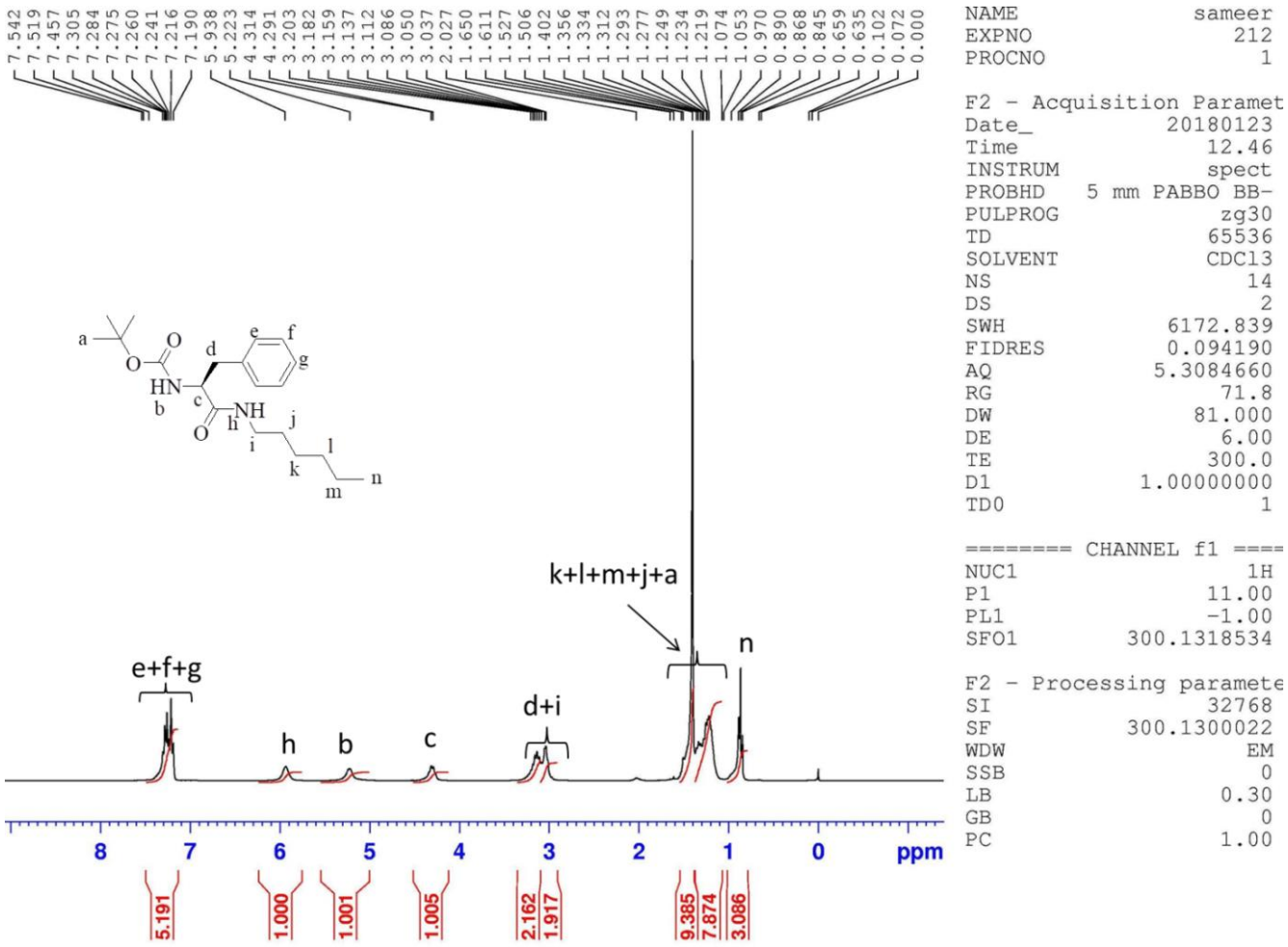


Fig. S18: ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of **A1**.

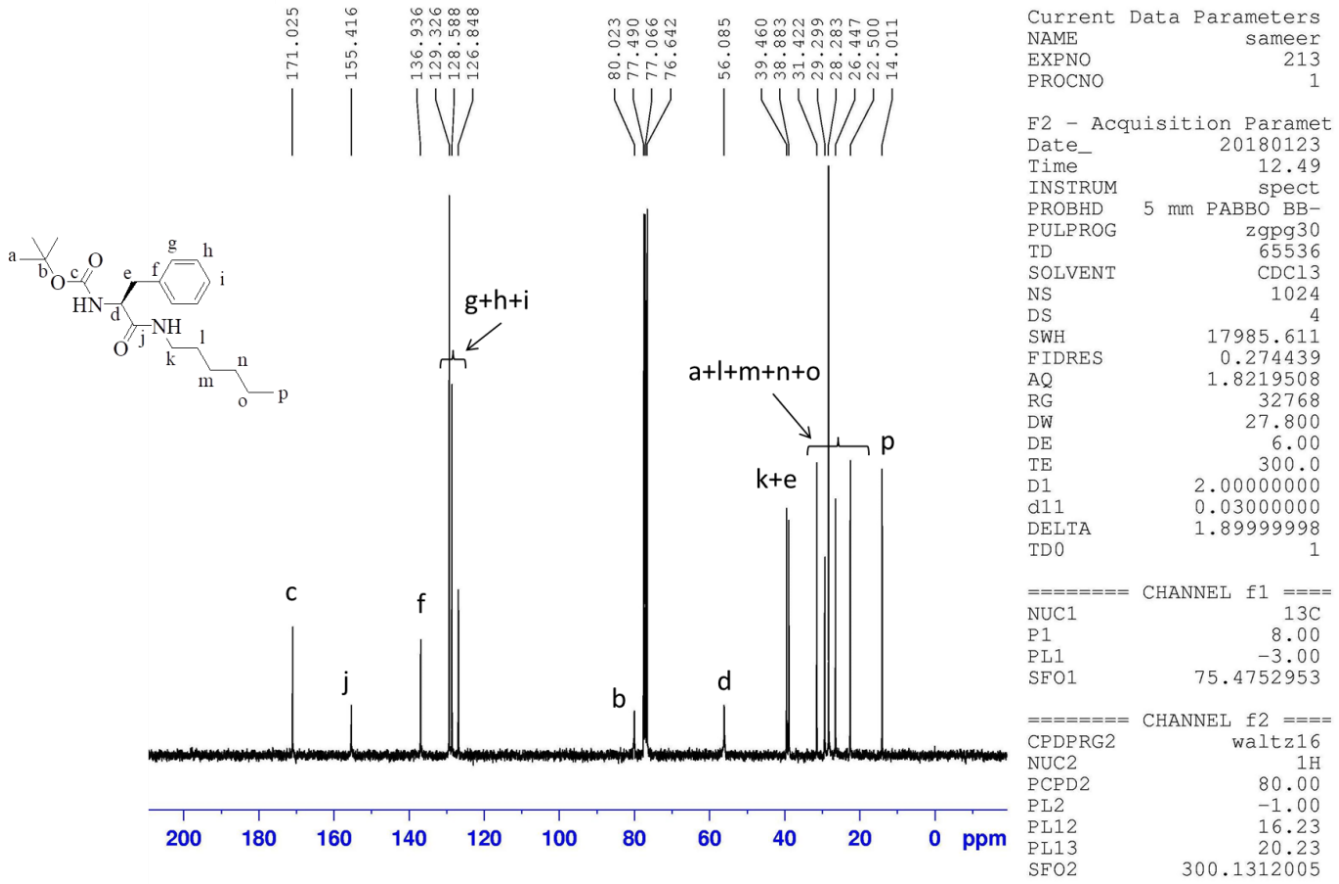
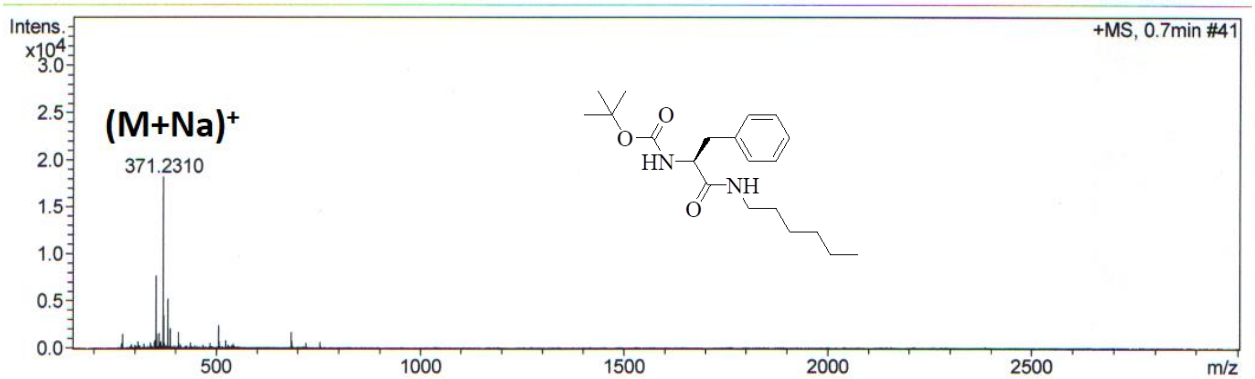


Fig. S19: ^{13}C NMR (75 MHz, $CDCl_3$) spectrum of **A1**.



Meas. m/z	#	Formula	m/z	err [ppm]	Mean err [ppm]	rdb	N-Rule	e⁻ Conf	mSigma	Std I	Std Mean m/z	Std I VarNorm	Std m/z Diff	Std Comb Dev
371.2310	1	C 20 H 32 N 2 Na O 3	371.2305	-1.3	0.4	5.5	ok	even	22.16	0.0367	0.0013	0.0153	0.0033	0.8427

Fig. S20: ESI-Mass spectrum of **A1**.

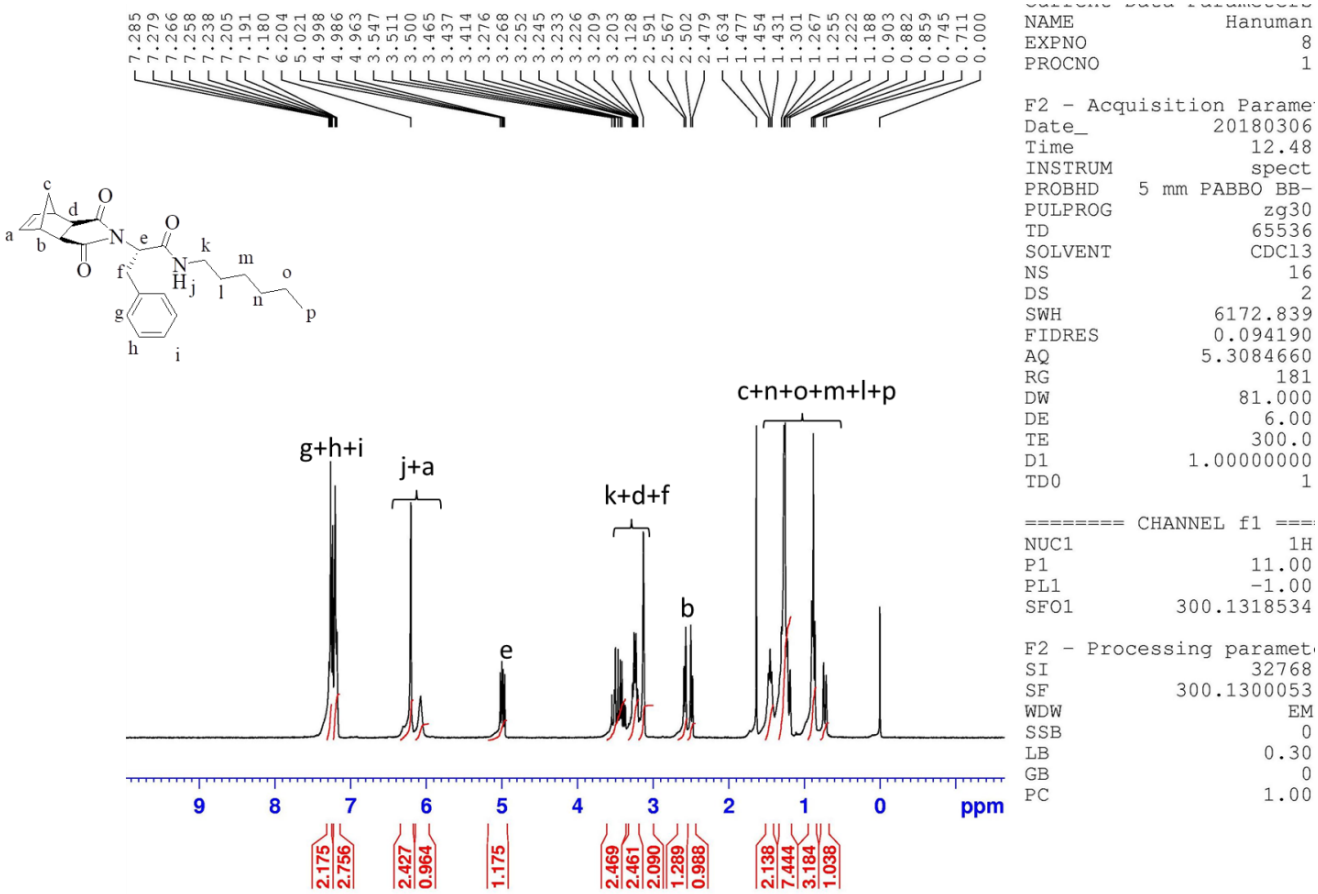


Fig. S21: ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of **FH**.

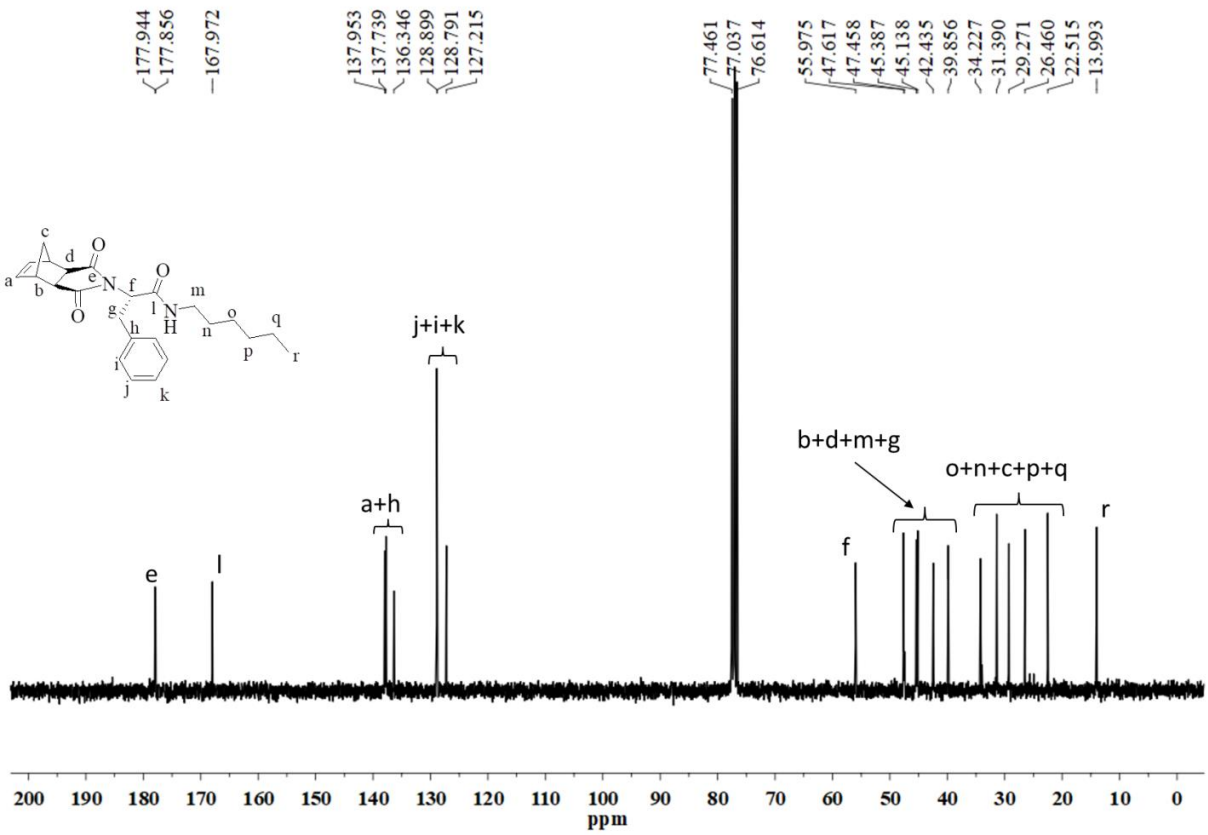
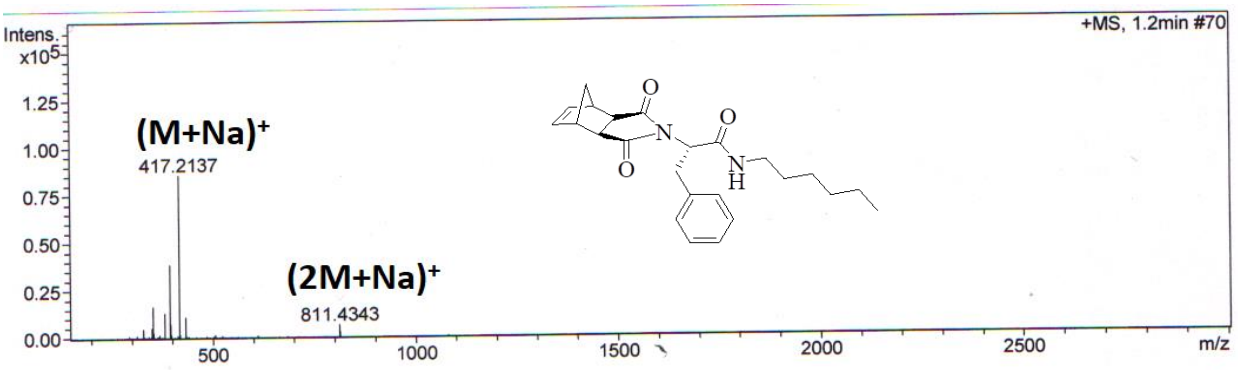


Fig. S22: ^{13}C NMR (75 MHz, $CDCl_3$) spectrum of **FH**.



Meas. m/z	#	Formula	m/z	err [ppm]	Mean err [ppm]	rdb	N-Rule	e⁻ Conf	mSigma	Std I	Std Mean m/z	Std I VarNorm	Std m/z Diff	Std Comb Dev
417.2137	1	C 24 H 30 N 2 Na O 3	417.2149	2.9	4.5	10.5	ok	even	26.50	0.0459	0.0023	0.0205	0.0035	0.8427

Fig. S23: ESI-Mass spectrum of **FH**.

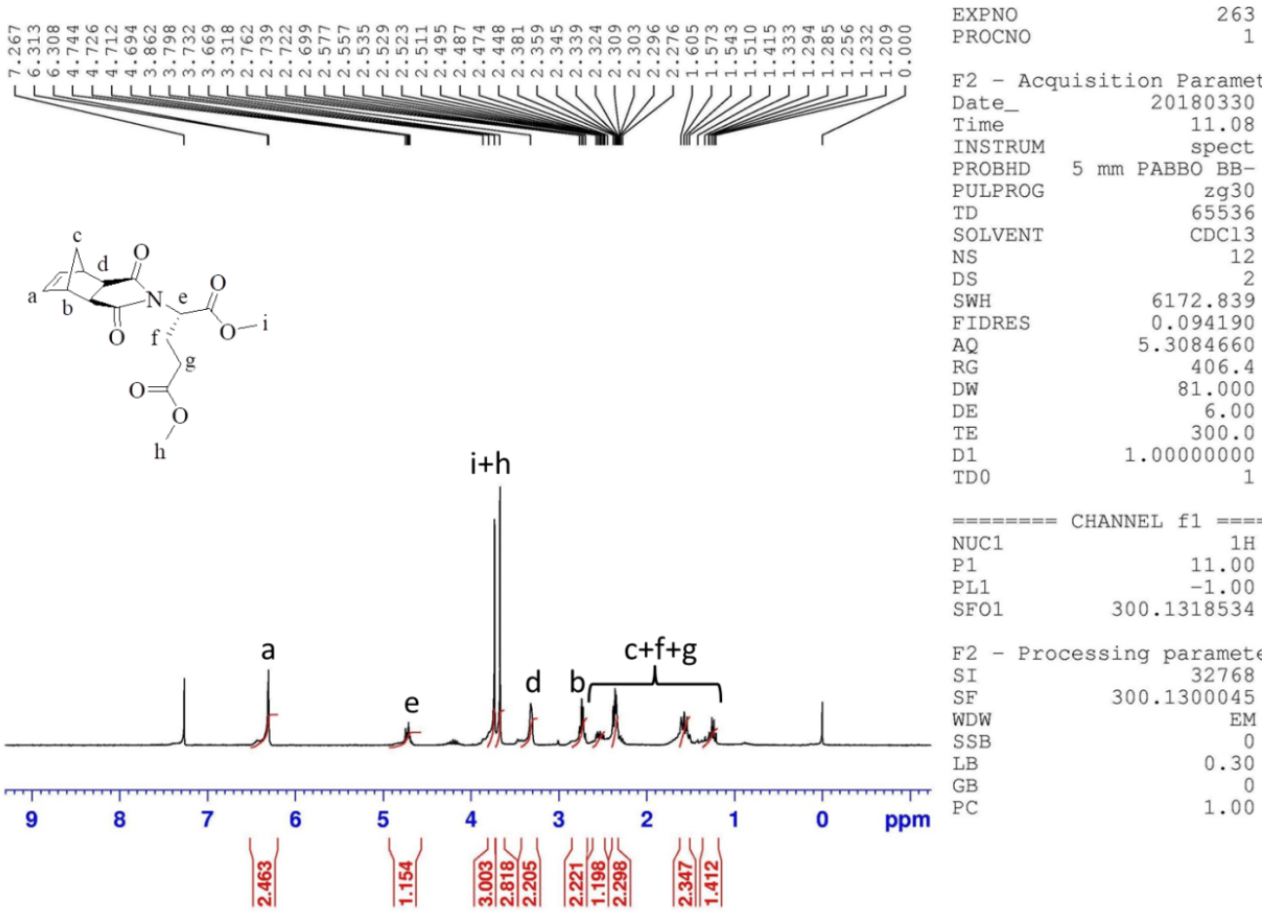


Fig. S24: ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of **EO**.

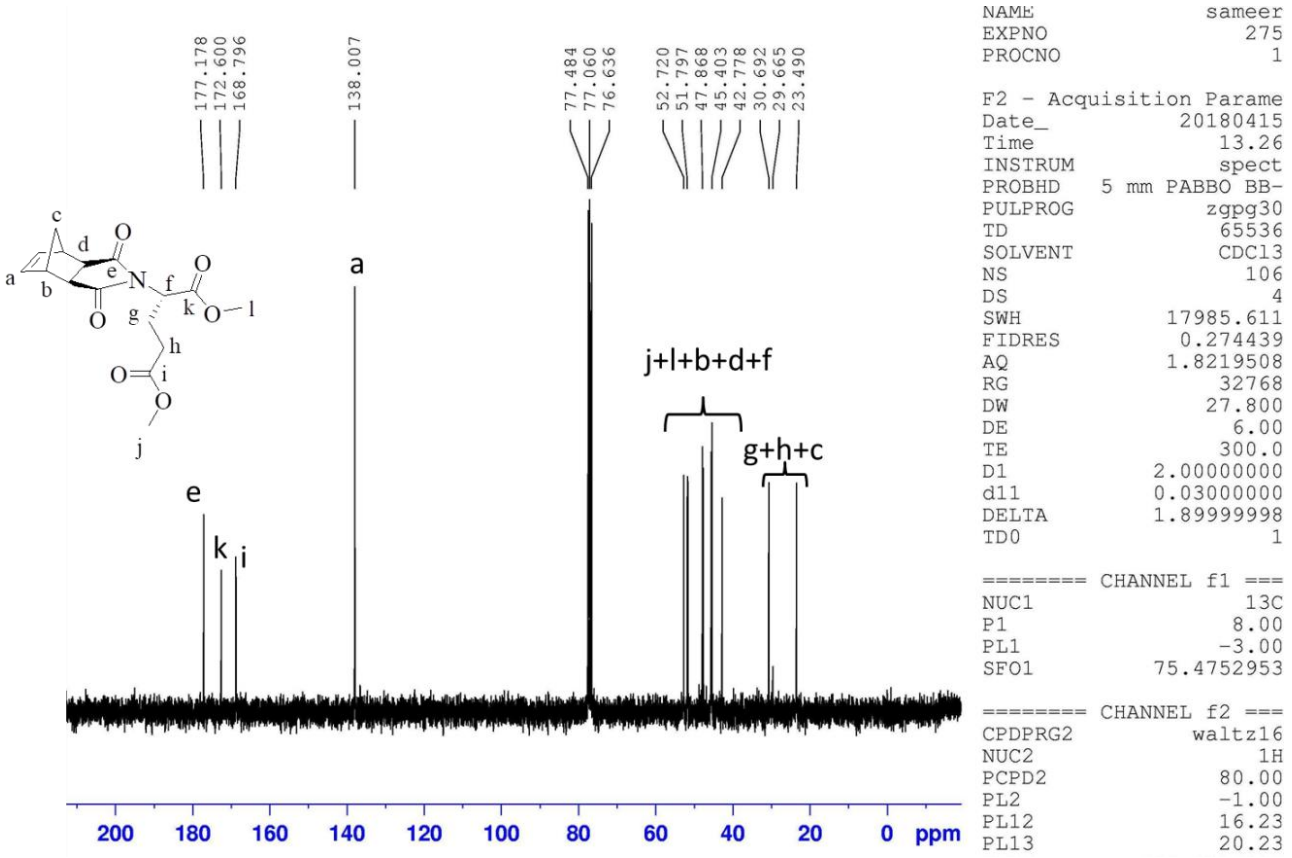
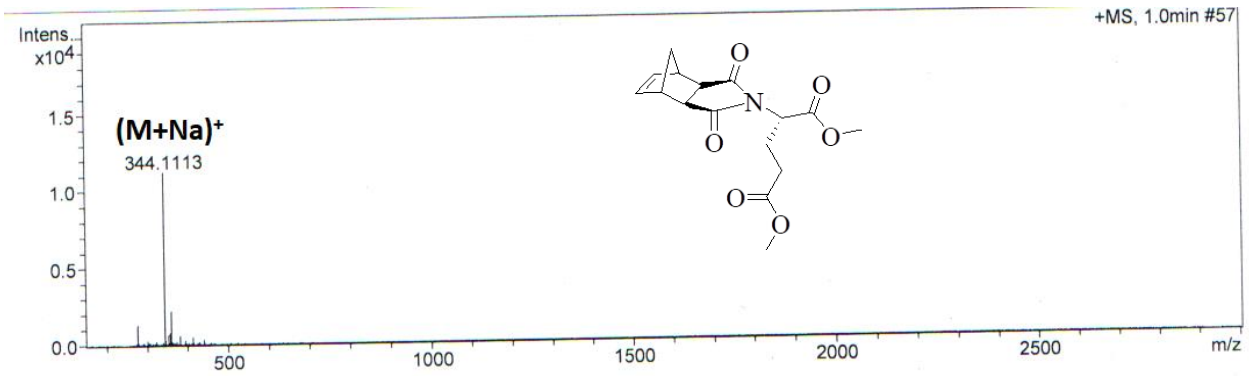


Fig. S25: ^{13}C NMR (75 MHz, $CDCl_3$) spectrum of **EO**.



Meas. m/z	#	Formula	m/z	err [ppm]	Mean err [ppm]	rdb	N-Rule	e⁻ Conf	mSigma	Std I	Std Mean m/z	Std I Var Norm	Std m/z Diff	Std Comb Dev
344.1113	1	C 16 H 19 N Na O 6	344.1105	-2.5	-3.5	7.5	ok	even	12.4	22.4	1.5	9.4	1.9	842.7

Fig. S26: ESI-Mass spectrum of **EO**.

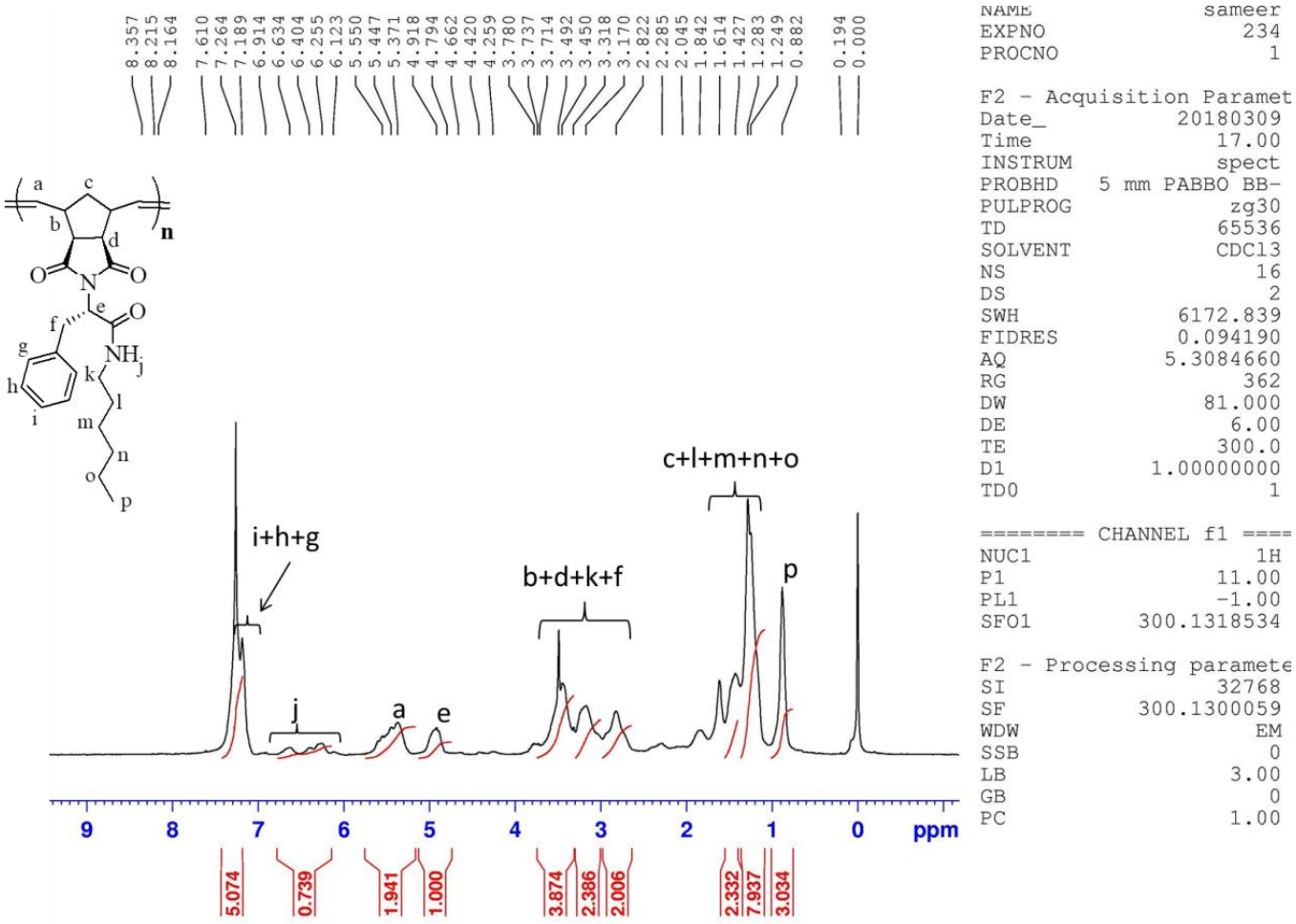



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Fig. S27: ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of **PFH**.

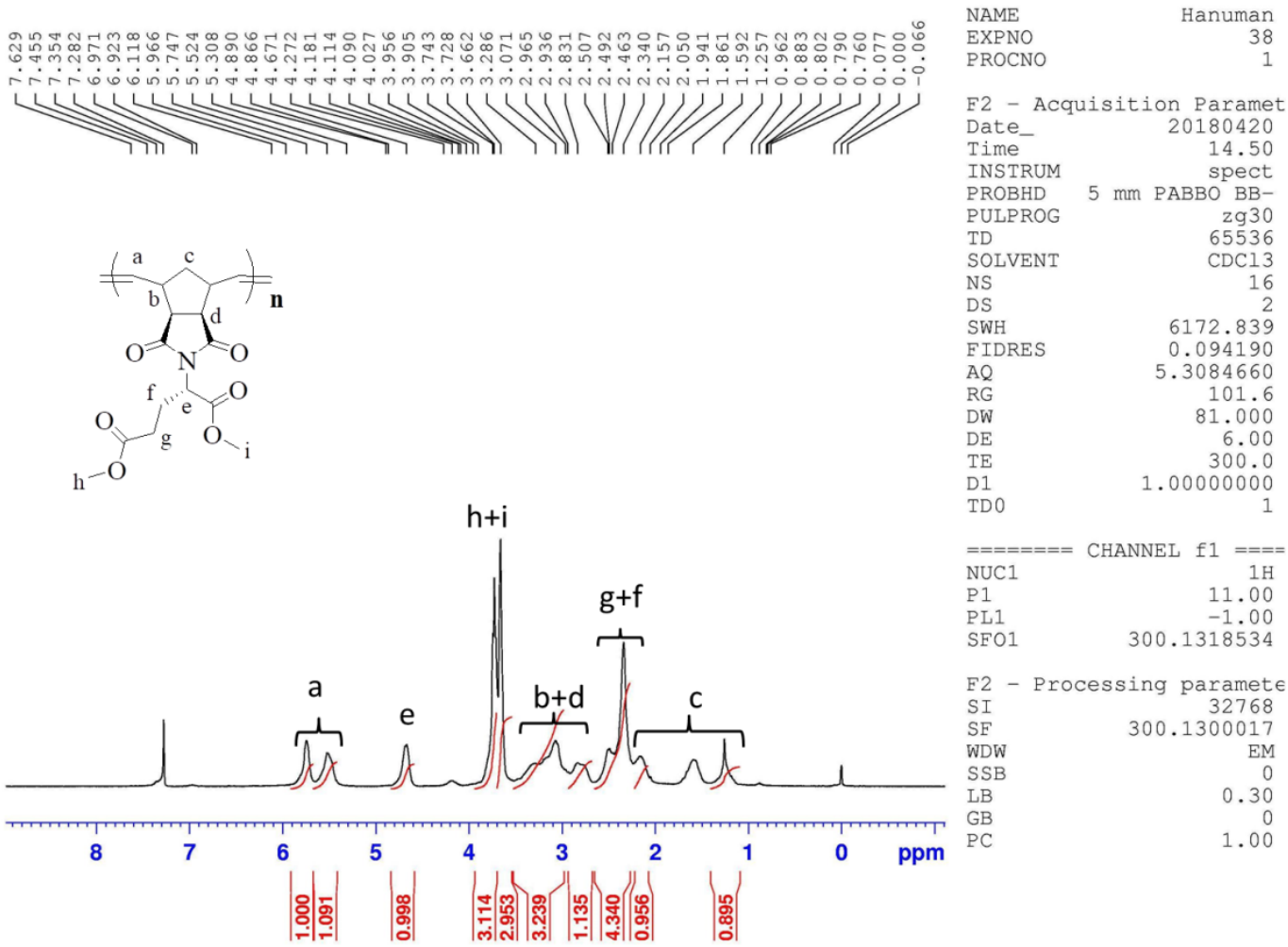

Fig. S28: ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of **PEO**.

Reference

1 H. N. Po and N. M. Senozan, *J. Chem. Educ.*, 2001, **78**, 1499.