Supplementary information of

Shape Selective Cracking of Polypropylene on H-MFI Type Zeolite Catalyst with Recovery of Cyclooctane Solvent

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Table S1: Compositions of solutions after polymer cracking experiments Entries 1−13.

Entry	catalyst	solvent	polymer	temperature / K	Yield / C-mol							
					C1 aliphatic	C2 aliphatic	C3 aliphatic	C4 aliphatic	C5 aliphatic	C6 aliphatic	C7 aliphatic	C8 aliphatic
1	No	cyclooctane	No	673	0.0000000	0.0000000	0.0000000	0.0000000	0.0000040	0.0000009	0.0003461	0.0002787
2	No	cyclooctane	PP	673	0.0000051	0.0000088	0.0000989	0.0000413	0.0003424	0.0000690	0.0004905	0.0000000
3	Parent MFI	cyclooctane	No	673	0.0000103	0.0000064	0.0000479	0.0000144	0.0008564	0.0000223	0.0000043	0.0000021
4	Parent MFI	No	PP	673	0.0000182	0.0000572	0.0006078	0.0002514	0.0003073	0.0001026	0.0000066	0.0000000
5	Parent MFI	cyclooctane	PP	673	0.0000001	0.0000003	0.0000019	0.0000045	0.0005841	0.0000000	0.0000563	0.0005282
6	Parent MFI	hexadecane	PP	673	0.0000212	0.0000350	0.0001738	0.0002744	0.0054377	0.0024777	0.0010178	0.0005029
7	Beta	cyclooctane	PP	673	0.0000043	0.0000597	0.0005628	0.0001583	0.0089914	0.0246989	0.0146217	0.0025716
8	Amorphous silica-alumina	cyclooctane	PP	673	0.0000189	0.0000261	0.0001201	0.0001370	0.0017003	0.0011054	0.0023550	0.0008058
9	Silica alkali-treated MFI	cyclooctane	PP	673	0.0001435	0.0005811	0.0002027	0.0001587	0.0007827	0.0002602	0.0001966	0.0001724
10	Silica alkali-treated MFI	cyclooctane	PP	693	0.0000704	0.0009877	0.0026827	0.0007547	0.0038291	0.0003152	0.0014880	0.0000048
11	Silica alkali-treated MFI	cyclooctane	LLDPE	673	0.0000338	0.0000617	0.0003629	0.0001078	0.0062396	0.0004769	0.0003378	0.0002531
12	Silica alkali-treated MFI	cyclooctane	GPPS	673	0.0000399	0.0000623	0.0002187	0.0000500	0.0032509	0.0001136	0.0012741	0.0004661
13	Silica alkali-treated MFI	No	PP	673	0.0000456	0.0001804	0.0020112	0.0007248	0.0008467	0.0001453	0.0000000	0.0000000

Entry	Yield / C-mol											
	C9 aliphatic	C10 aliphatic	C11 aliphatic	C12 aliphatic	C13 aliphatic	C14 aliphatic	C15 aliphatic	C16 aliphatic	C17 aliphatic	C18 aliphatic	C19 aliphatic	C20 aliphatic
1	0.0000000	0.0000854	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
2	0.0001782	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
3	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000005	0.0000004	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
4	0.0000186	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
5	0.0001113	0.0001110	0.0000000	0.0000000	0.0000000	0.0000000	0.0000729	0.0001660	0.0000000	0.0000000	0.0000000	0.0000000
6	0.0001681	0.0000924	0.0000319	0.0000171	0.0000190	0.0000193	0.0000407	0.0000010	0.0000096	0.0000221	0.0000148	0.0000036
7	0.0003976	0.0006142	0.0002283	0.0001449	0.0000172	0.0000000	0.0000093	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
8	0.0003890	0.0002594	0.0003847	0.0003467	0.0000000	0.0000000	0.0004044	0.0004041	0.0003173	0.0002650	0.0001439	0.0000987
9	0.0001401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0014911	0.0000000	0.0000000	0.0000000	0.0000000
10	0.0004088	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000610	0.0000788	0.0000000	0.0000000	0.0000000	0.0000000
11	0.0000660	0.0000649	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
12	0.0003529	0.0000341	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
13	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000410	0.0000000	0.0000000	0.0000000	0.0000000

Entry	Yield / C-mol											
	C21 aliphatic	C22 aliphatic	C23 aliphatic	C24 aliphatic	C25 aliphatic	C26 aliphatic	C27 aliphatic	C28 aliphatic	C6 monocyclic	C7 monocyclic	C8 monocyclic	C9 monocyclic
1	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000118	0.0000000	0.0000000	0.0000000
2	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000704	0.0000000	0.0001276	0.0000899
3	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000290	0.0002202	0.0002346	0.0000329
4	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000147	0.0001320	0.0002404	0.0000823
5	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0005953	0.0002915	0.0005559	0.0002527
6	0.0000025	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0004443	0.0004201
7	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0043743	0.0032450	0.0044834	0.0034927
8	0.0000526	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0006889	0.0002416	0.0009808	0.0002832
9	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0001525	0.0000000	0.0000992	0.0001281	0.0003242	0.0007181
10	0.0000836	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0004919	0.0005142	0.0014908	0.0014644
11	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0005219	0.0015825	0.0011242
12	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0006427	0.0012086	0.0016623	0.0005601
13	0.0000450	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0004680

Entry	Yield / C-mol											
	C10 monocyclic	C11 monocyclic	C12 monocyclic	C13 monocyclic	C14 monocyclic	C15 monocyclic	C16 monocyclic	C17 monocyclic	C10 dicyclic	C11 dicyclic	C12 dicyclic	C13 dicyclic
1	0.0000000	0.0000000	0.0000040	0.0000000	0.0000000	0.0000000	0.0000000	0.0000070	0.0000000	0.0000000	0.0000000	0.0000000
2	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
3	0.0000073	0.0000018	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000185	0.0000684	0.0000270	0.0000055
4	0.0000317	0.0000047	0.0000018	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000290	0.0000604	0.0000541	0.0000162
5	0.0000412	0.0005137	0.0000000	0.0001369	0.0000000	0.0000000	0.0000000	0.0000000	0.0000784	0.0002797	0.0002218	0.0000484
6	0.0001565	0.0000874	0.0000248	0.0000026	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000047	0.0000000	0.0000000
7	0.0006065	0.0000000	0.0012862	0.0000000	0.0000000	0.0001666	0.0000000	0.0000000	0.0000000	0.0000000	0.0006372	0.0000000
8	0.0001544	0.0000000	0.0001393	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
9	0.0000000	0.0000000	0.0000613	0.0000000	0.0000000	0.0001049	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
10	0.0000000	0.0000000	0.0003298	0.0000000	0.0000000	0.0001635	0.0000000	0.0000000	0.0001295	0.0007709	0.0008444	0.0000000
11	0.0006856	0.0006364	0.0005168	0.0001871	0.0002831	0.0001169	0.0000550	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
12	0.0004989	0.0007198	0.0008518	0.0002027	0.0005789	0.0003340	0.0003962	0.0006078	0.0000000	0.0000000	0.0000000	0.0000000
13	0.0000000	0.0000000	0.0000250	0.0000000	0.0000000	0.0001560	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Entry	Yield / C-mol								
	C14 dicyclic	C15 dicyclic	C14 tricyclic	C15 tricyclic	C16 tricyclic	C17 tricyclic	C18 tricyclic	C19 tricyclic	C18 tetracyclic
1	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
2	0.0000000	0.0000779	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
3	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
4	0.0000044	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
5	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
6	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
7	0.0000000	0.0015704	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
8	0.0000000	0.0003584	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
9	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
10	0.0000000	0.0003585	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
11	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
12	0.0004675	0.0006547	0.0011963	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0001688
13	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

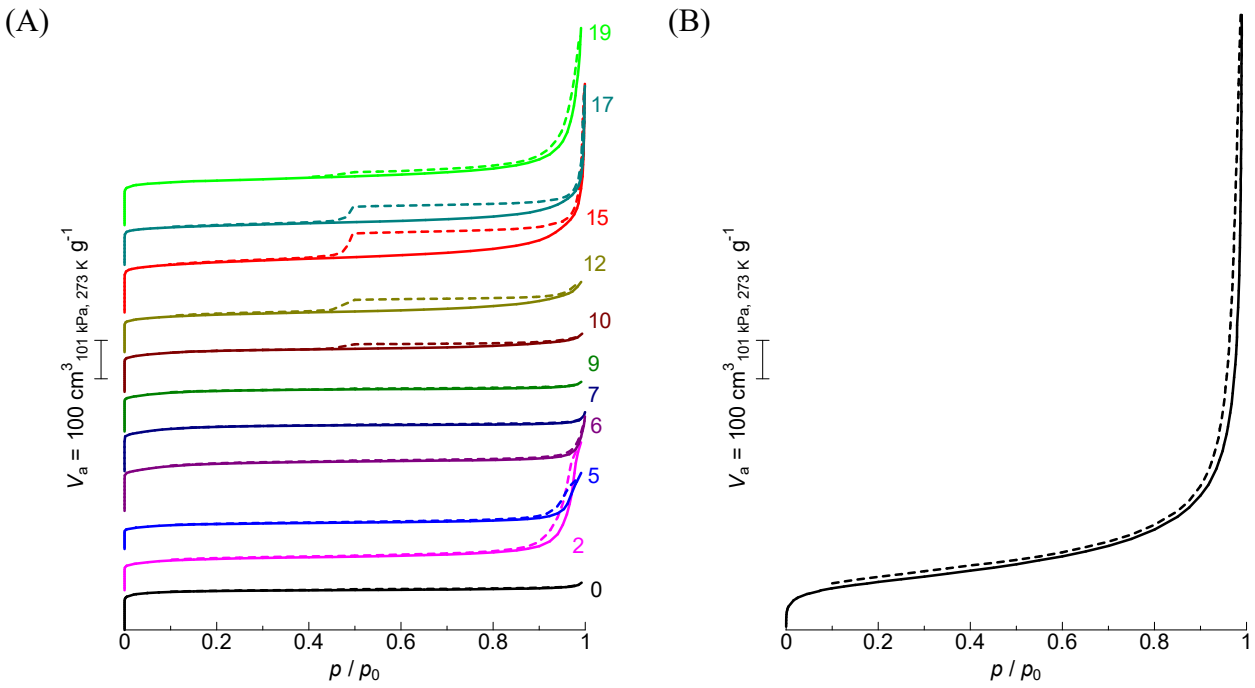

Figure S1: Nitrogen adsorption (solid line) / desorption (dotted line) isotherms of employed (A) zeolite samples and (B) amorphous silica Reolosil at 77 K. The digit in (A) shows the amount of NaOH used for the silica-alkali treatment in the unit of mol $kg_{zeolite}^{-1}$. V_a shows the amount of adsorbed nitrogen under equilibrium for gaseous nitrogen with p of the pressure at 77 K, expressed by the volume of gas at 101 kPa and 273 K. p_0 shows the vapor pressure of nitrogen at 77 K (101 kPa).

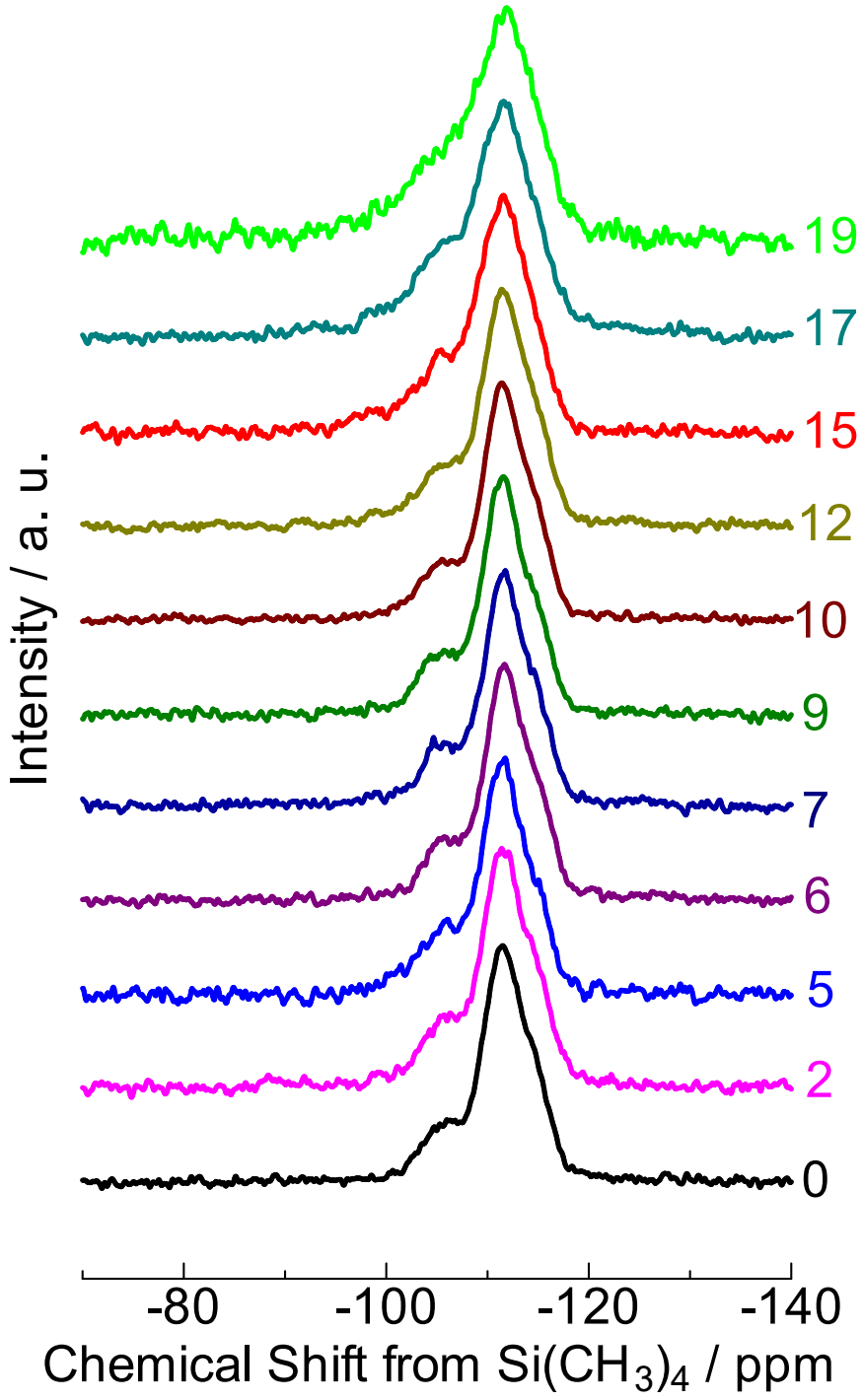

Figure S2: ^{29}Si NMR spectra. The digit shows the amount of NaOH used for the silica-alkali treatment in the unit of mol $kg_{zeolite}^{-1}$.

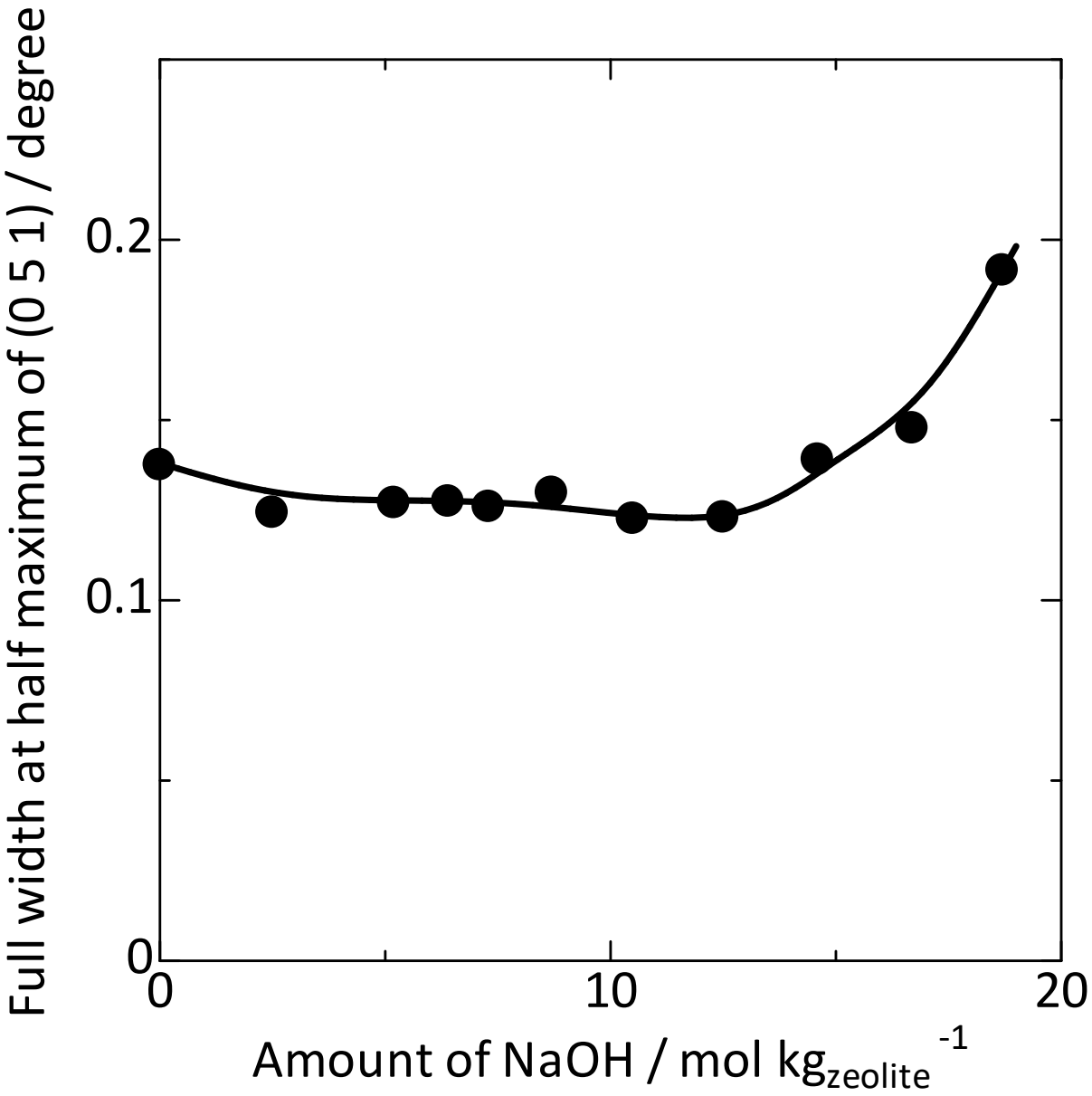

Figure S3: Full width at half maximum of diffraction ascribed to **MFI** (0 5 1) plane (2θ = 23.1º) observed by X-ray diffraction (Figure 1).

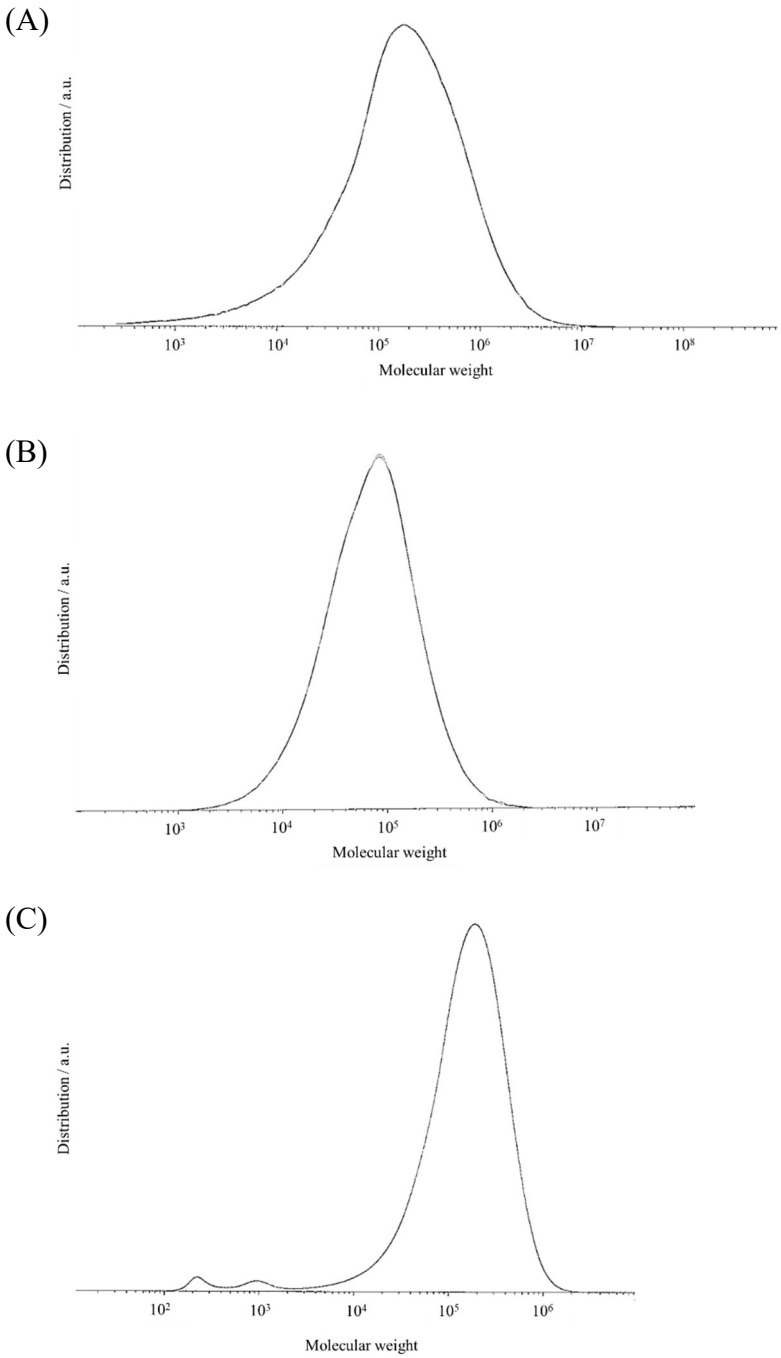

Figure S4: Molecular weight distribution of (A) PP, (B) LLDPE and (C) GPPS used in this study determined by the gel permeation chromatography (GPC). For each polymer sample, the experiment was repeated, and two curves overlapped. In each case, the repeated experiments gave almost identical results that looked like one distribution curve. The measurements were performed using a Tosoh HLC-8321GPC/HT chromatograph, a gel guard column HHR(30)HT (inner diameter: 7.5 mm,

length: 7.5 cm), three columns GMHHR-H(20)HT (inner diameter: 7.8 mm, length: 30 cm), and a refractive index detector, with eluent [1,2,4-trichlorobenzene (99.5%) + 2,6-di-*tert*-butyl-*p*-cresol (0.05%), 1.0 cm^3 min^{-1}] at 413 K.