Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Conversion and coking of olefins on SAPO-34

Bing Hu, Guoliang Mao,* Dakang Wang, Yadong Fu, Baohui Wang, and

Mingjian Luo*

Provincial Key Laboratory of Oil & Gas Chemical Technology, College of Chemistry & Chemical Engineering, Northeast Petroleum University, Daqing 163318, Heilongjiang, P.R. China.

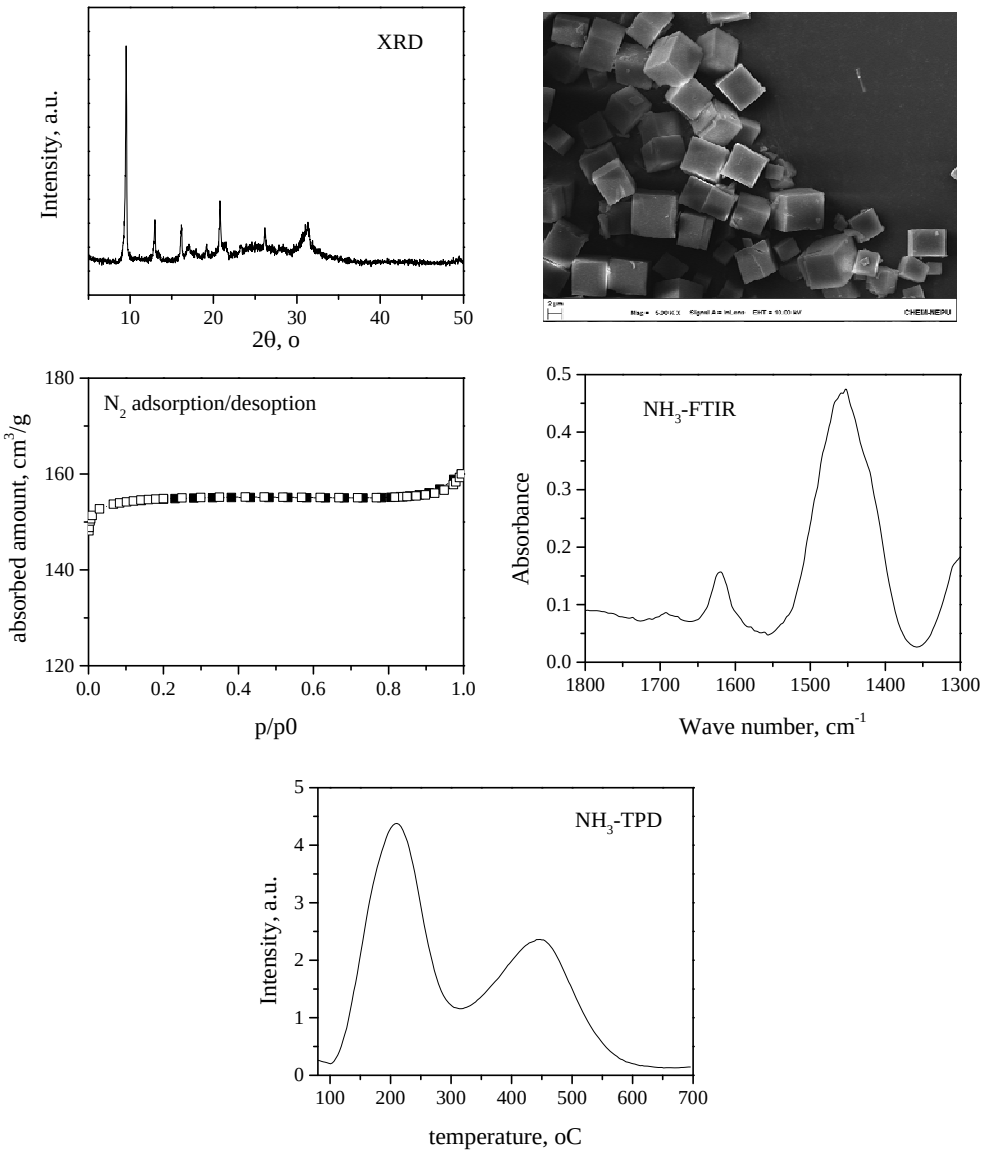

Figure S1. Properties of SAPO-34 used.

Note: for NH_3-FTIR, the sample was pressed in to self-supporting wafer, evacuated at 425 ^oC for 30 min, NH_3 is introduced at 100 ^oC, and spectrum was recorded after remove gas phase NH_3.

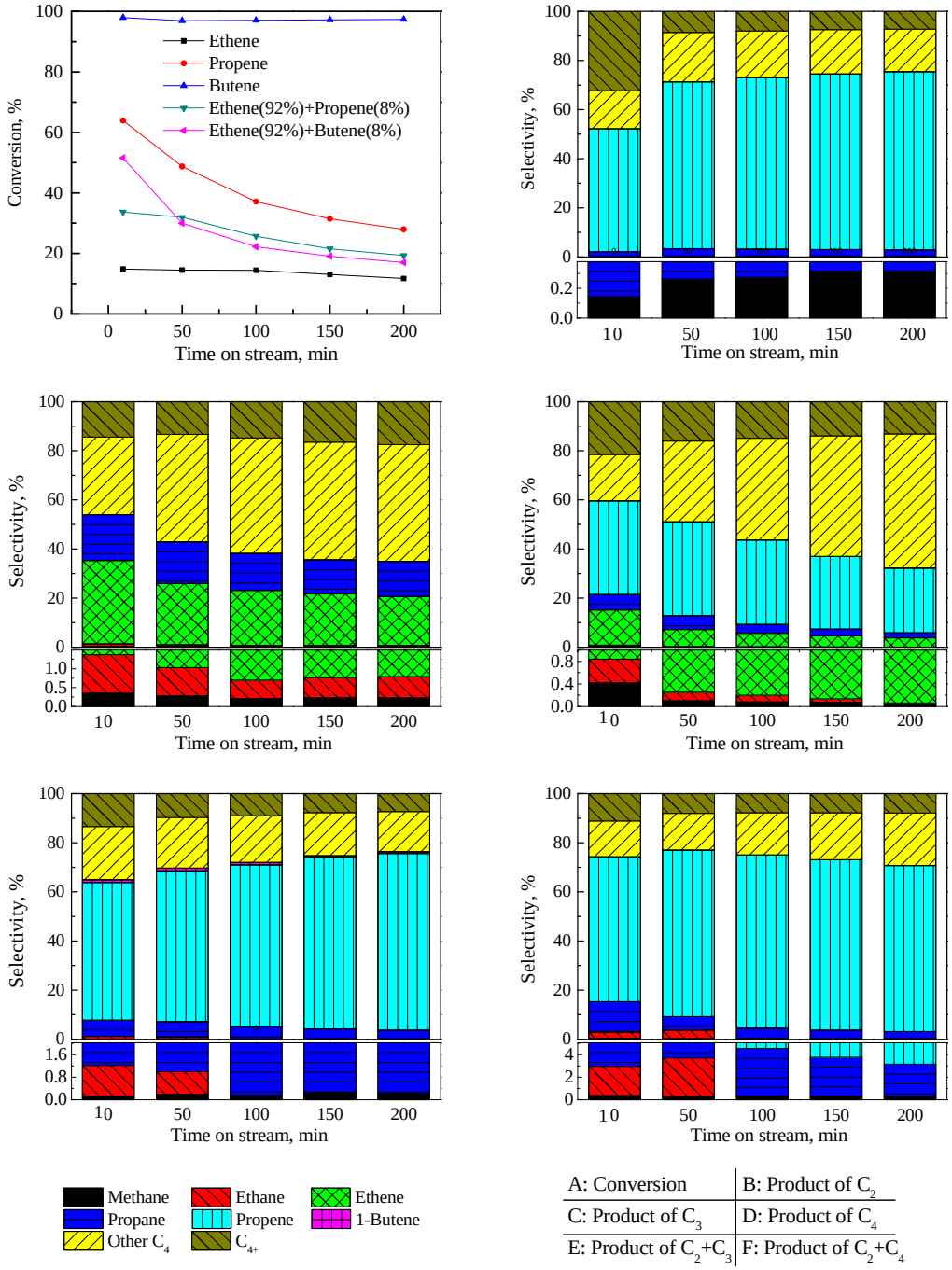

Figure S2. Conversion of olefin and product selectivities of different olefin feedstock.

Note: All other compounds are regarded as products for feedstock C_2+C_3 and C_2+C_4

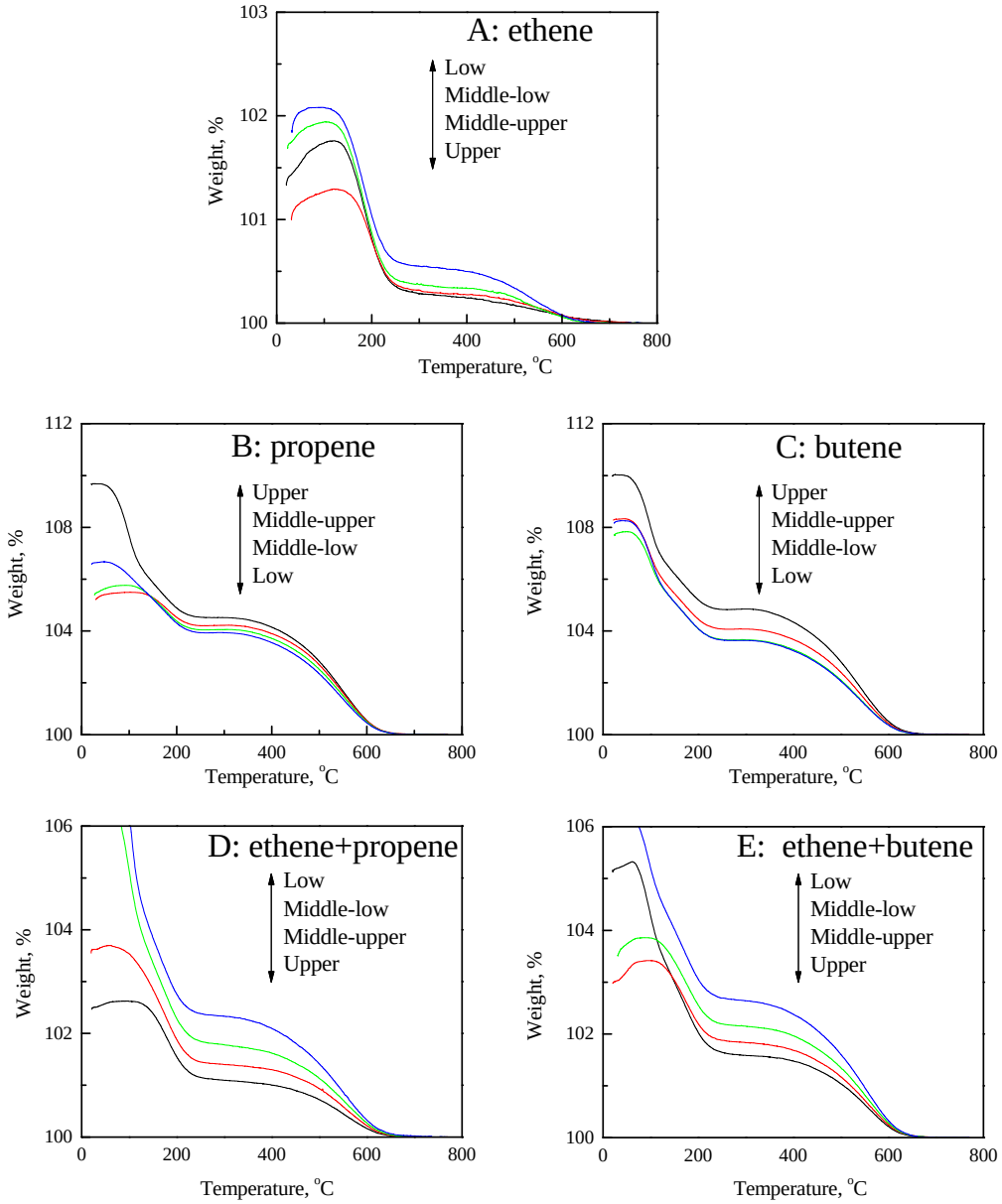

Figure S3. TG profiles of coked catalyst at 100 min.

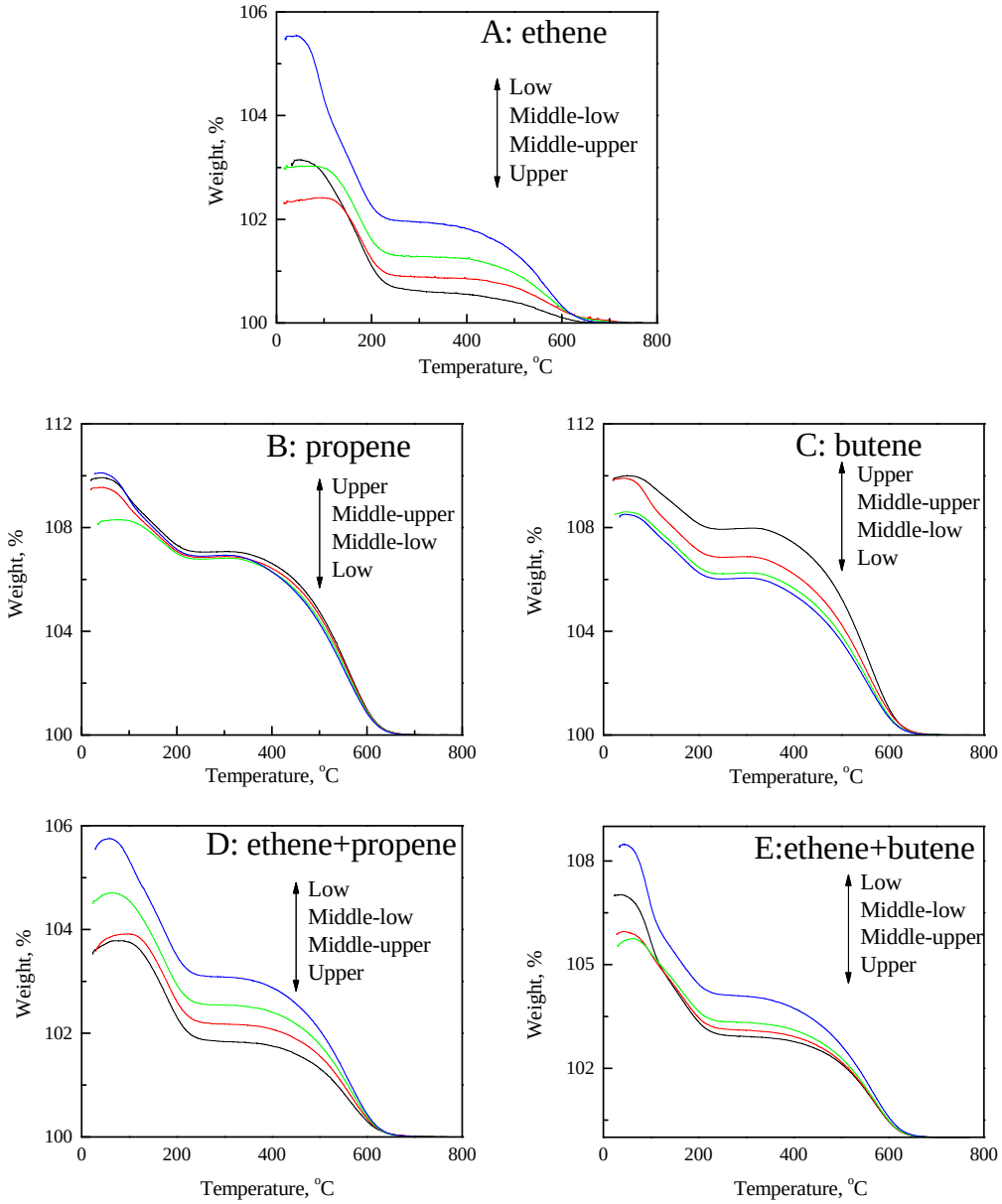

Figure S4. TG profiles of coked catalyst at 200 min.

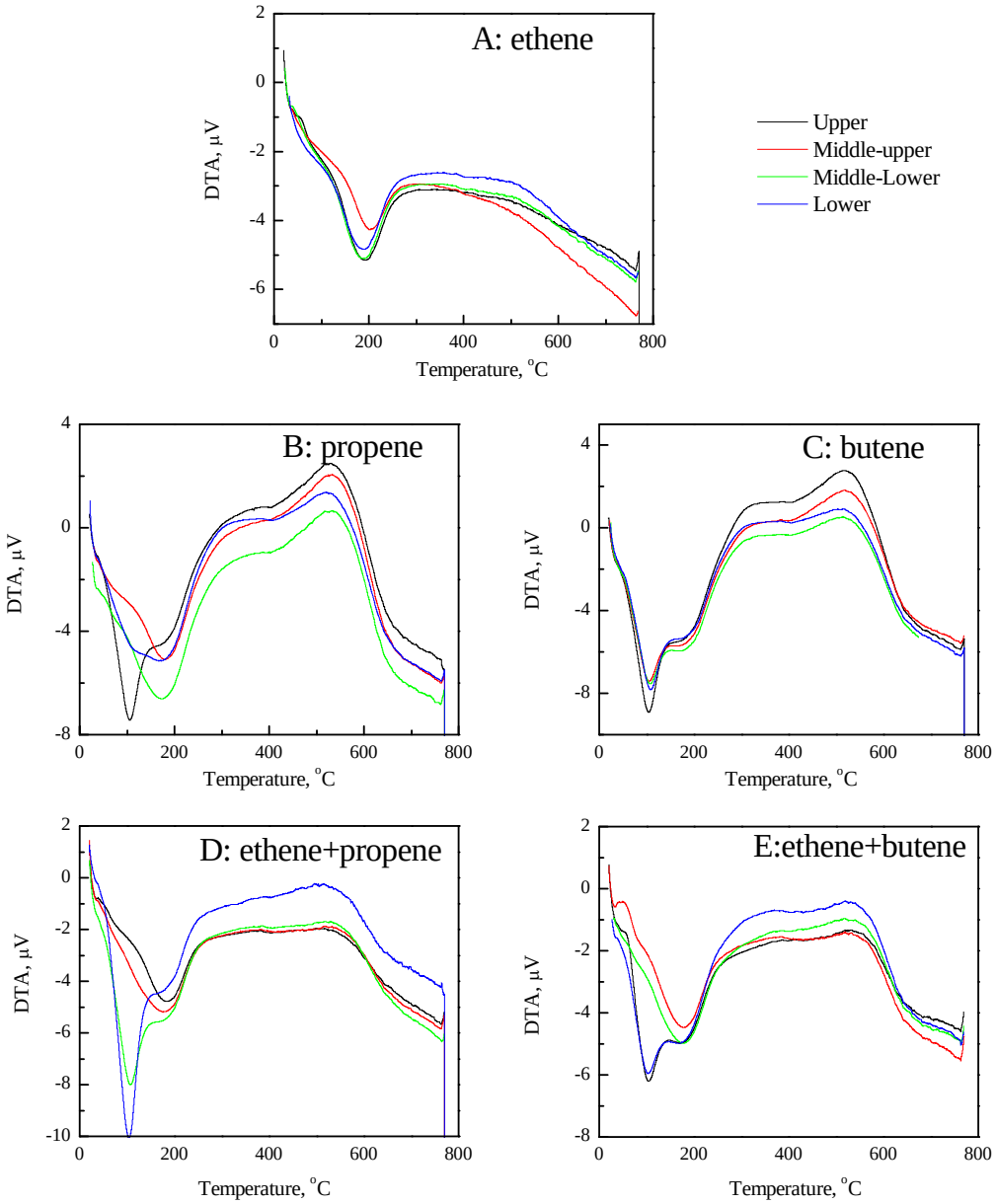

Figure S5. DTA profiles of coked catalyst at 100 min.

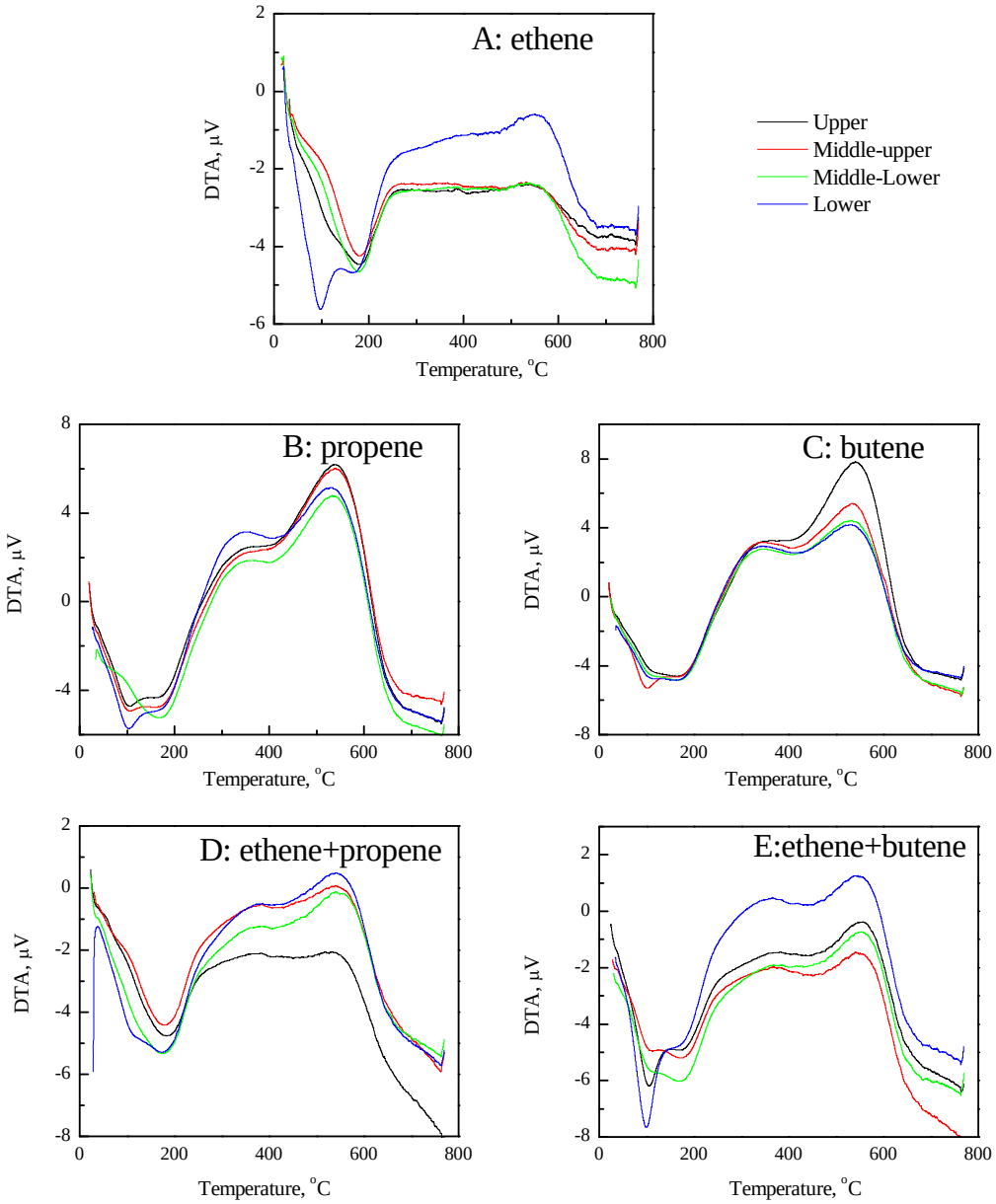

Figure S6. DTA profiles of coked catalyst at 200 min.

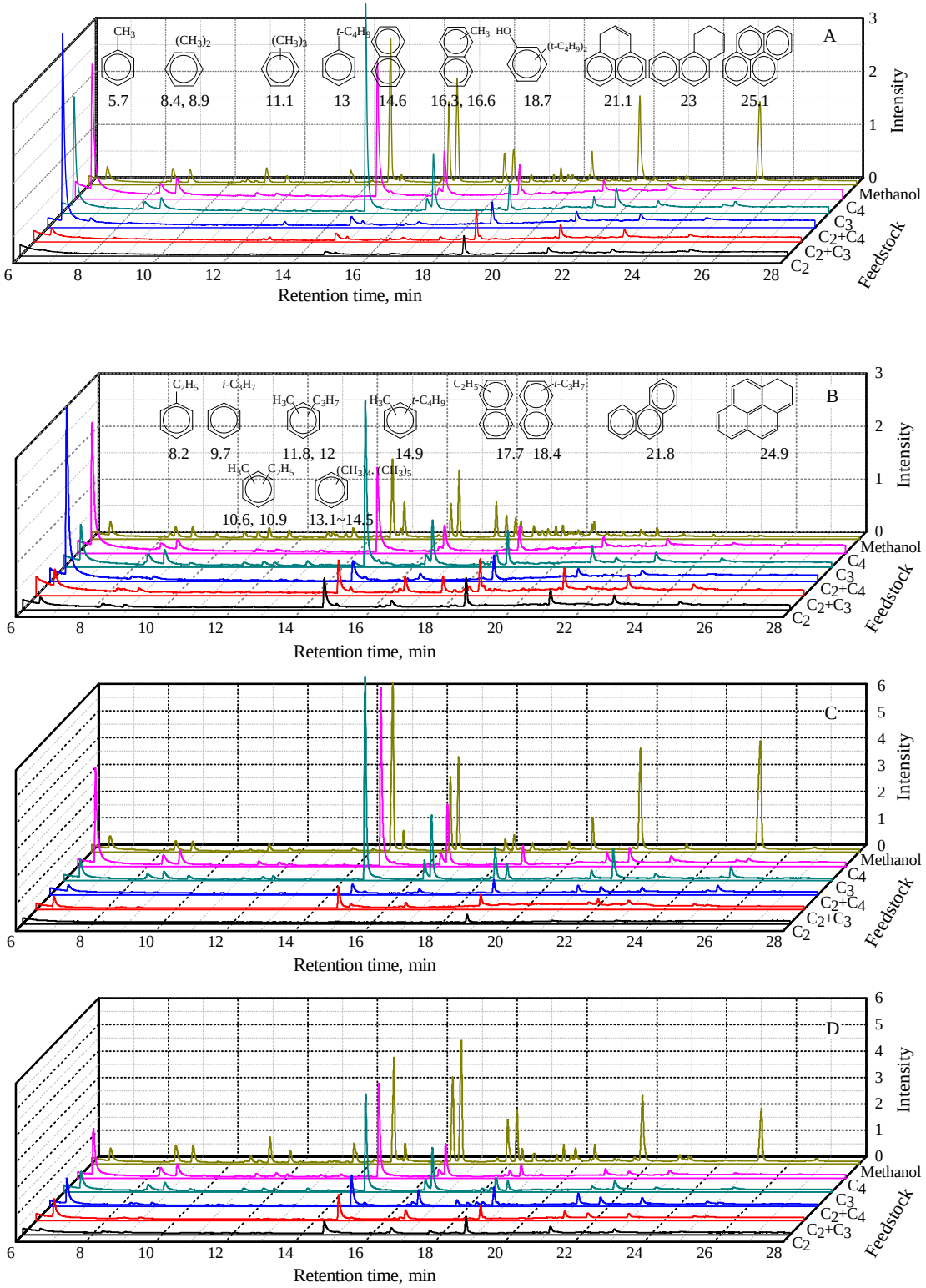

Figure S7. Gas chromatograms of solvable coke. A: upper section catalyst at 100 min; B: lower section catalyst at 100 min; C: upper section catalyst at 200 min; D: lower section catalyst at 200 min. Chromatograms of methanol are adapted from Ref[1] with scale factor 0.1 (A and B) or 0.2 (C and D).

Note: the di-*tert*-butylphenol at 18.7 min should be originated from the plastic tube.

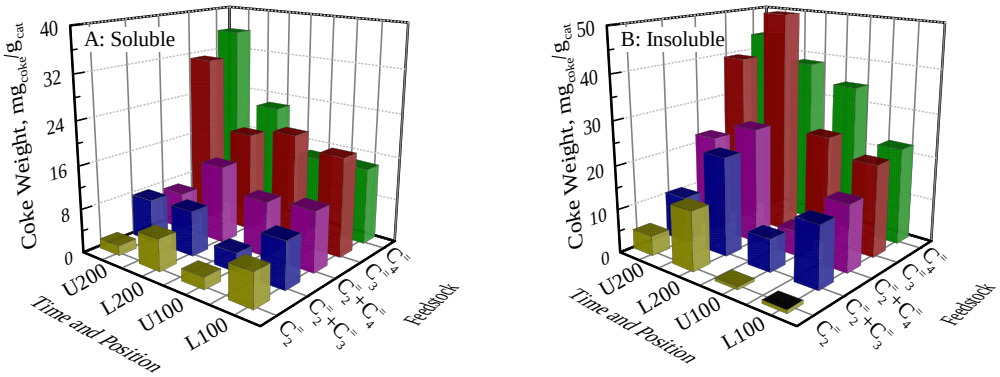

Figure S8. Soluble and insoluble coke distribution.

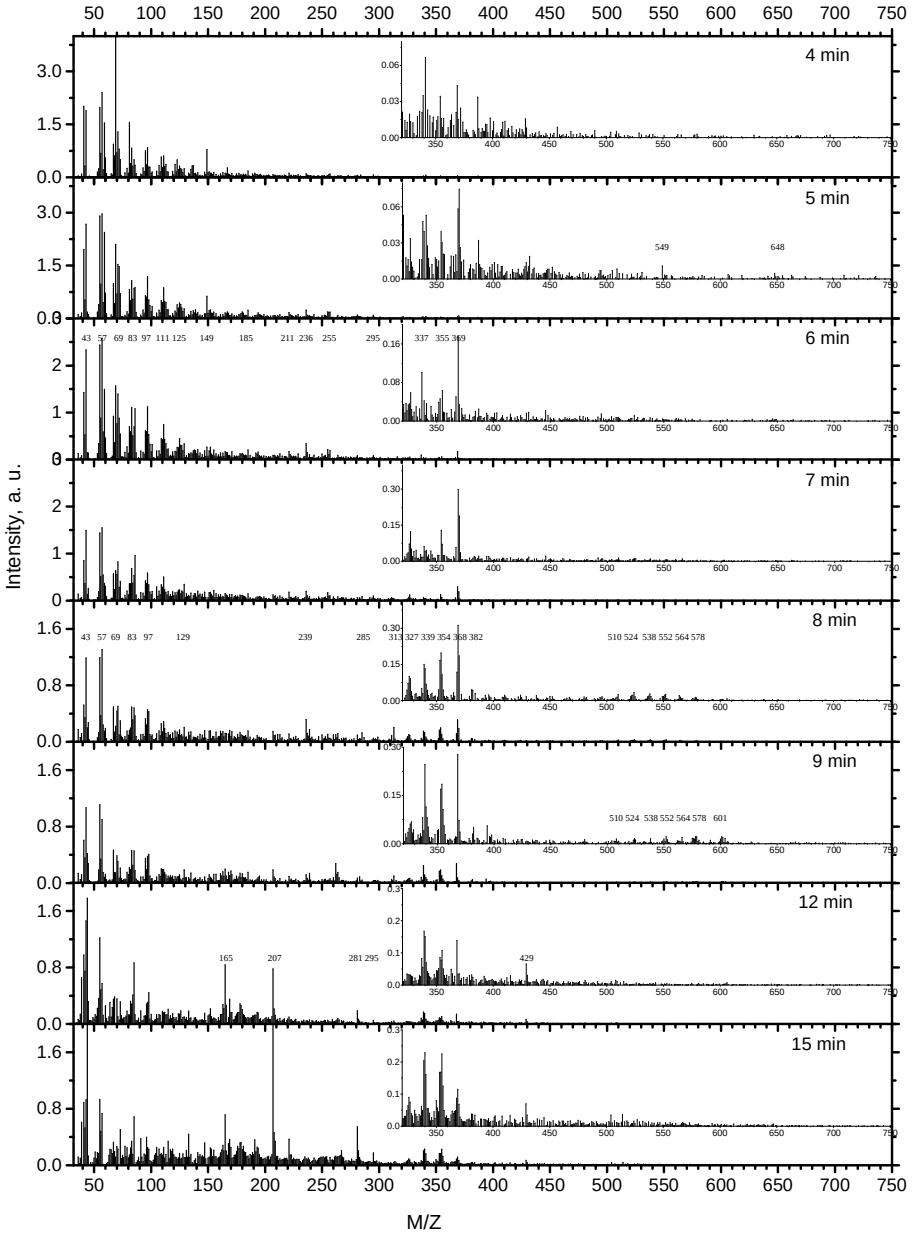

Figure S9. Mass spectra at specified time (C2 feedstock, upper section).

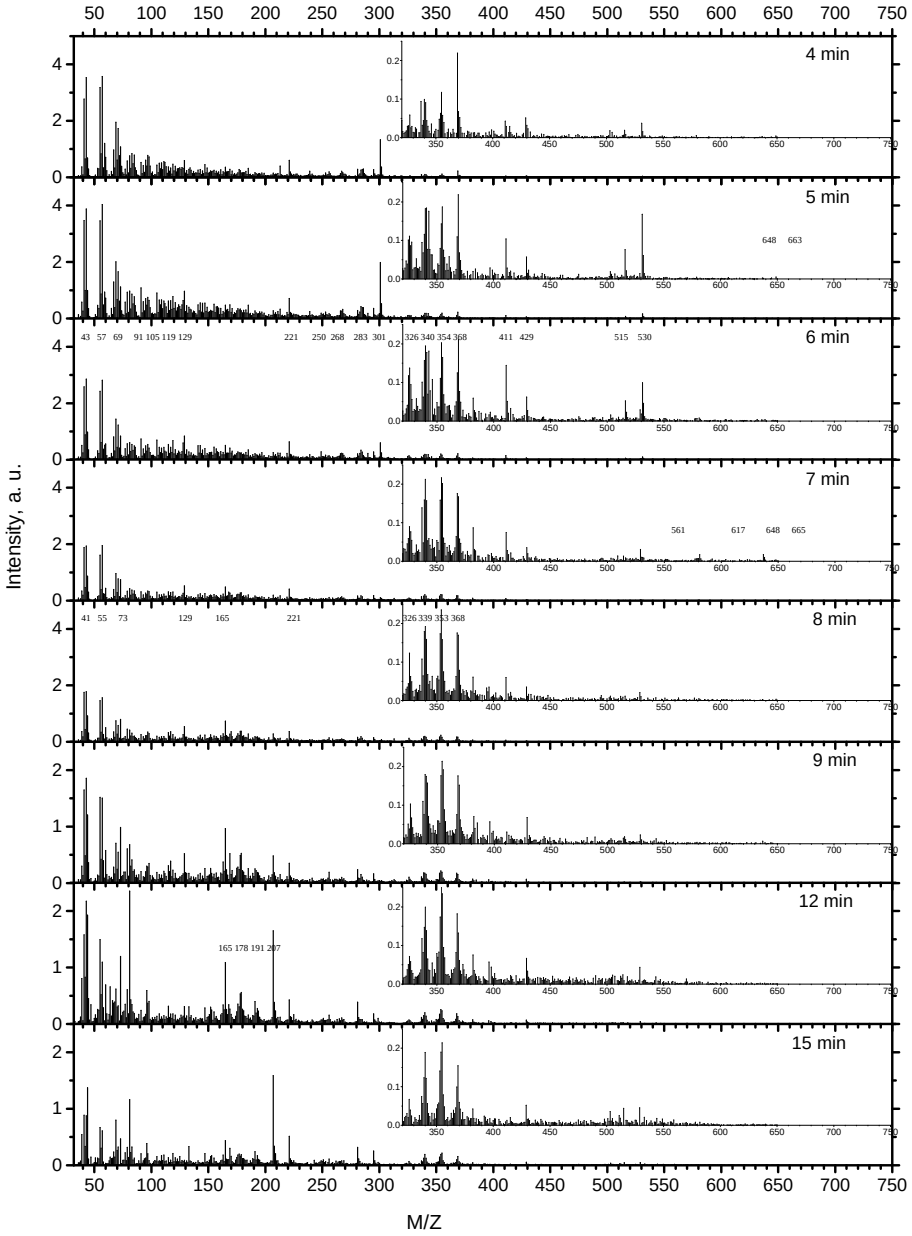

Figure S10. Mass spectra at specified time (C2 feedstock, lower section).

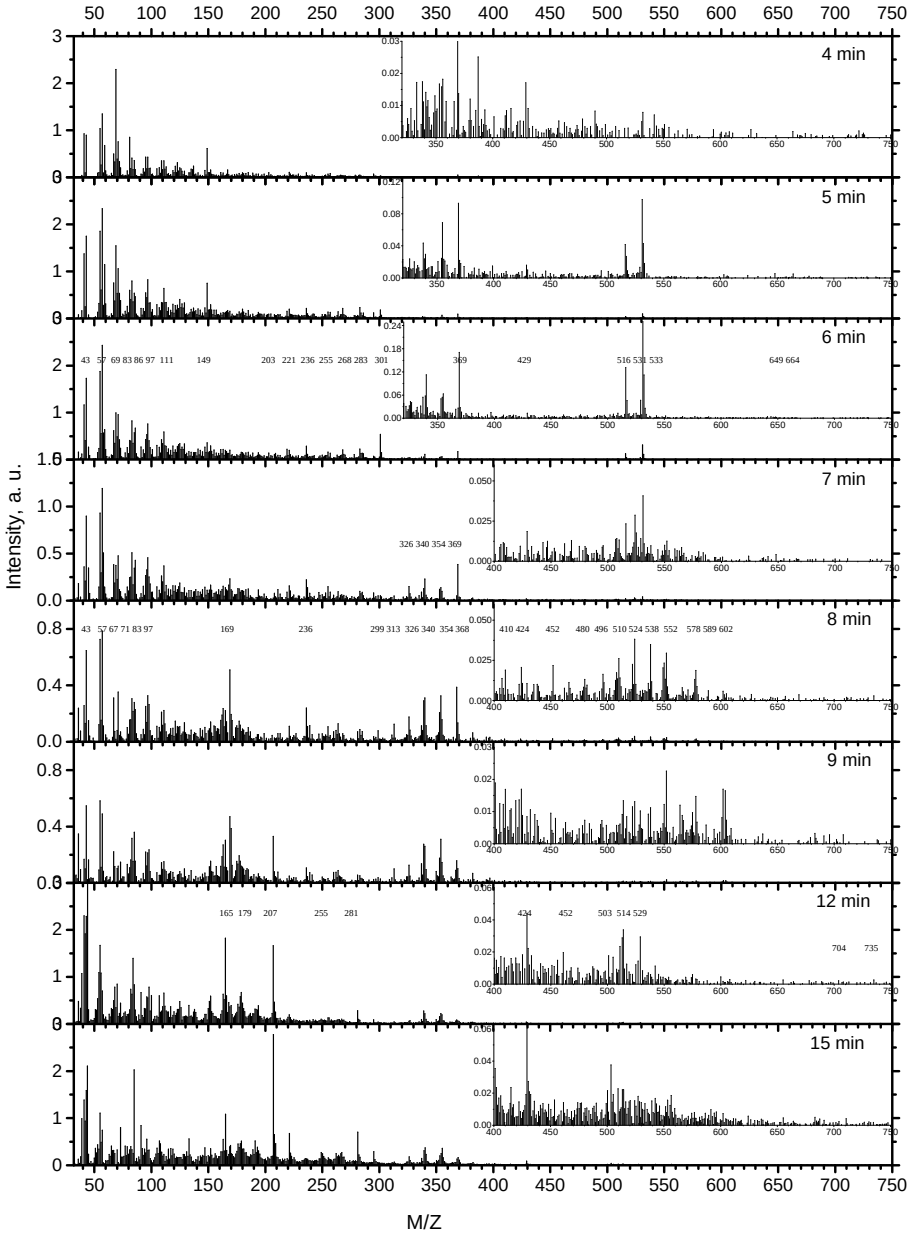

Figure S11. Mass spectra at specified time (C2+C3 feedstock, upper section).

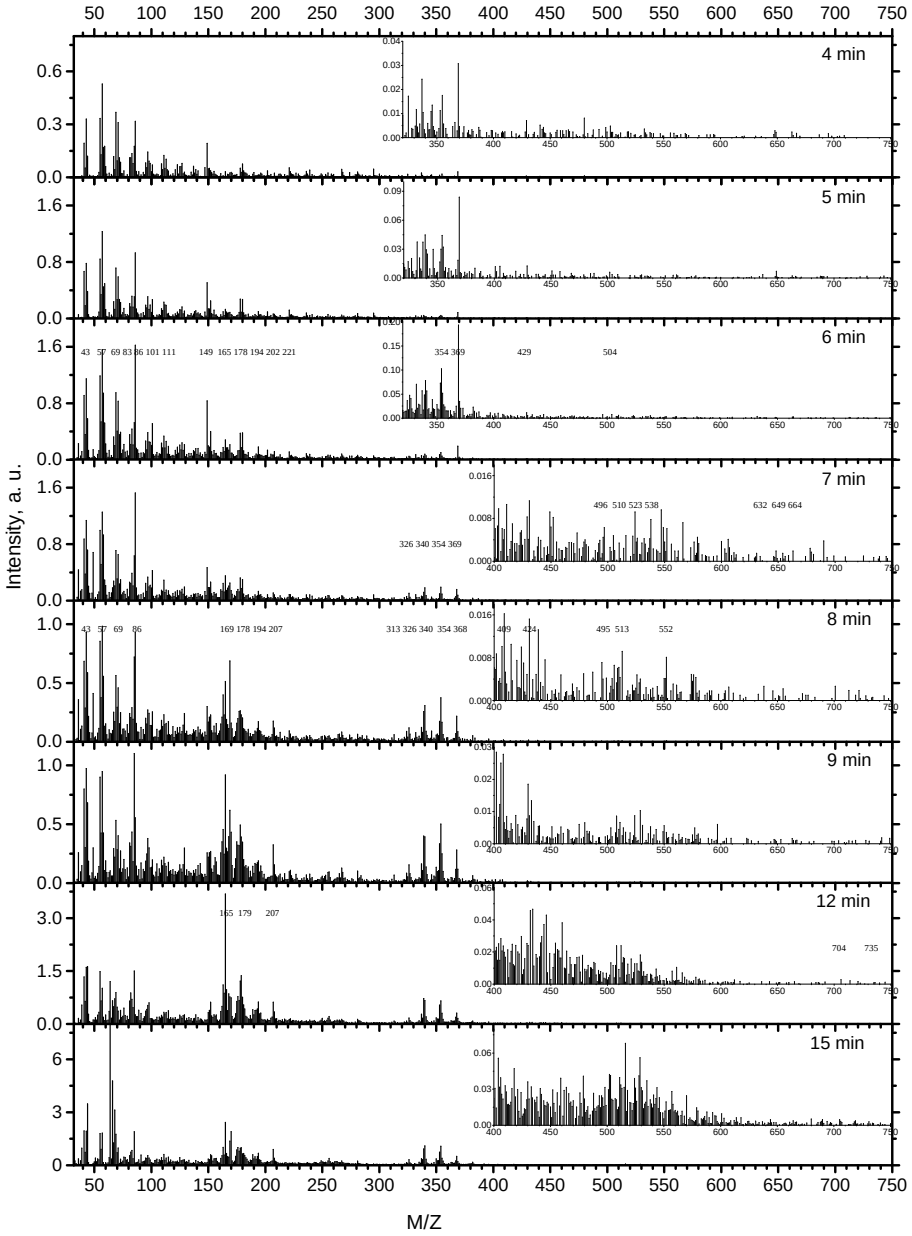

Figure S12. Mass spectra at specified time (C2+C3 feedstock, lower section).

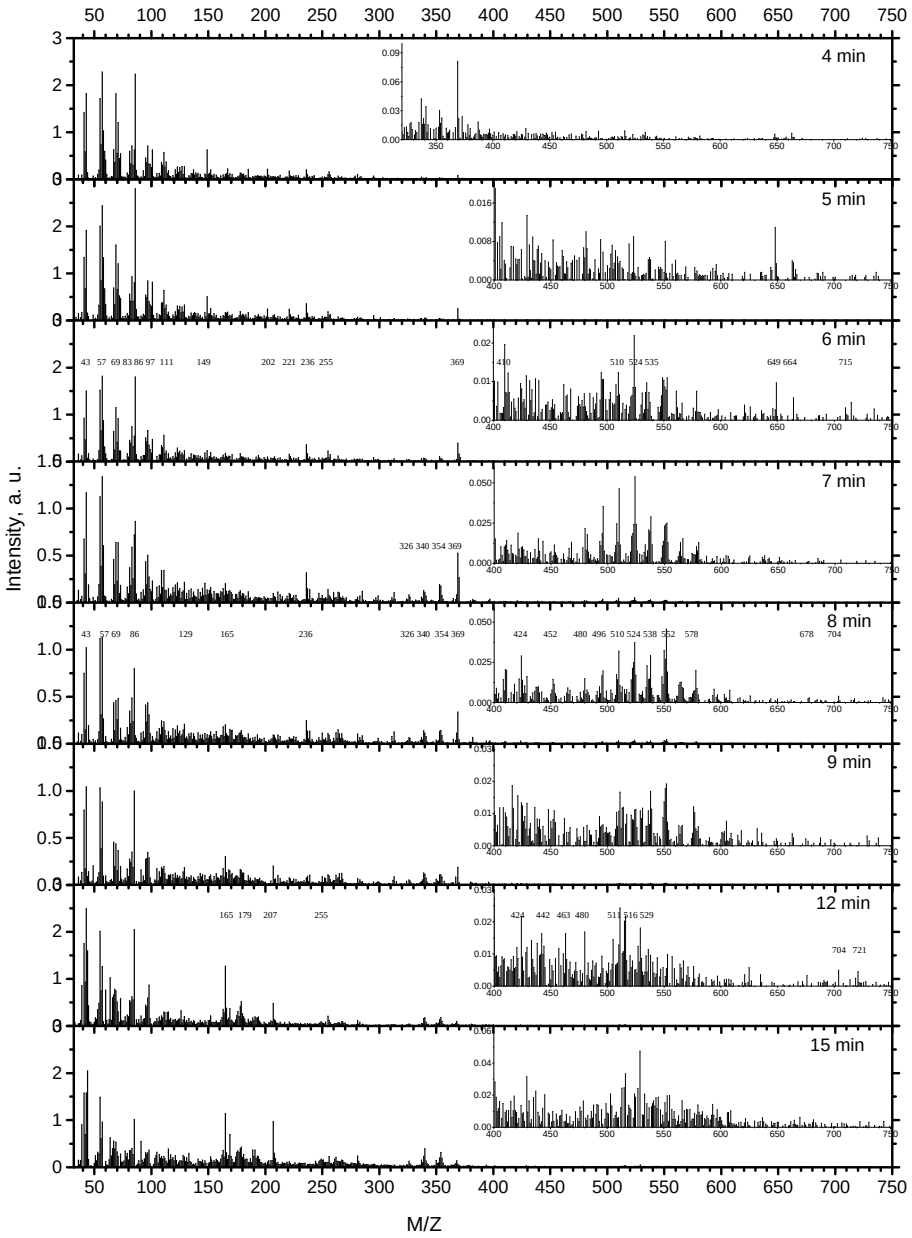

Figure S13. Mass spectra at specified time (C2+C4 feedstock, upper section).

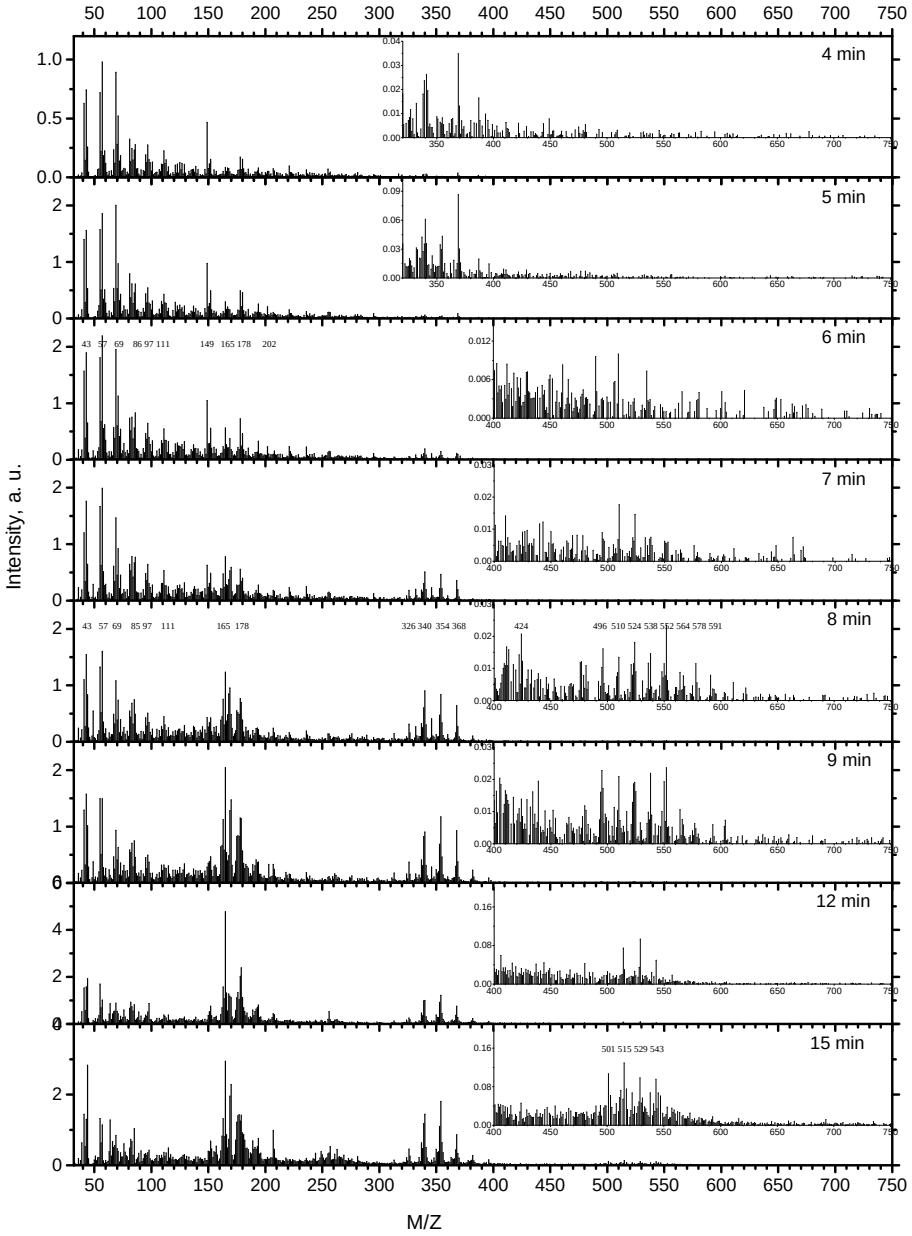

Figure S14. Mass spectra at specified time (C2+C4 feedstock, lower section).

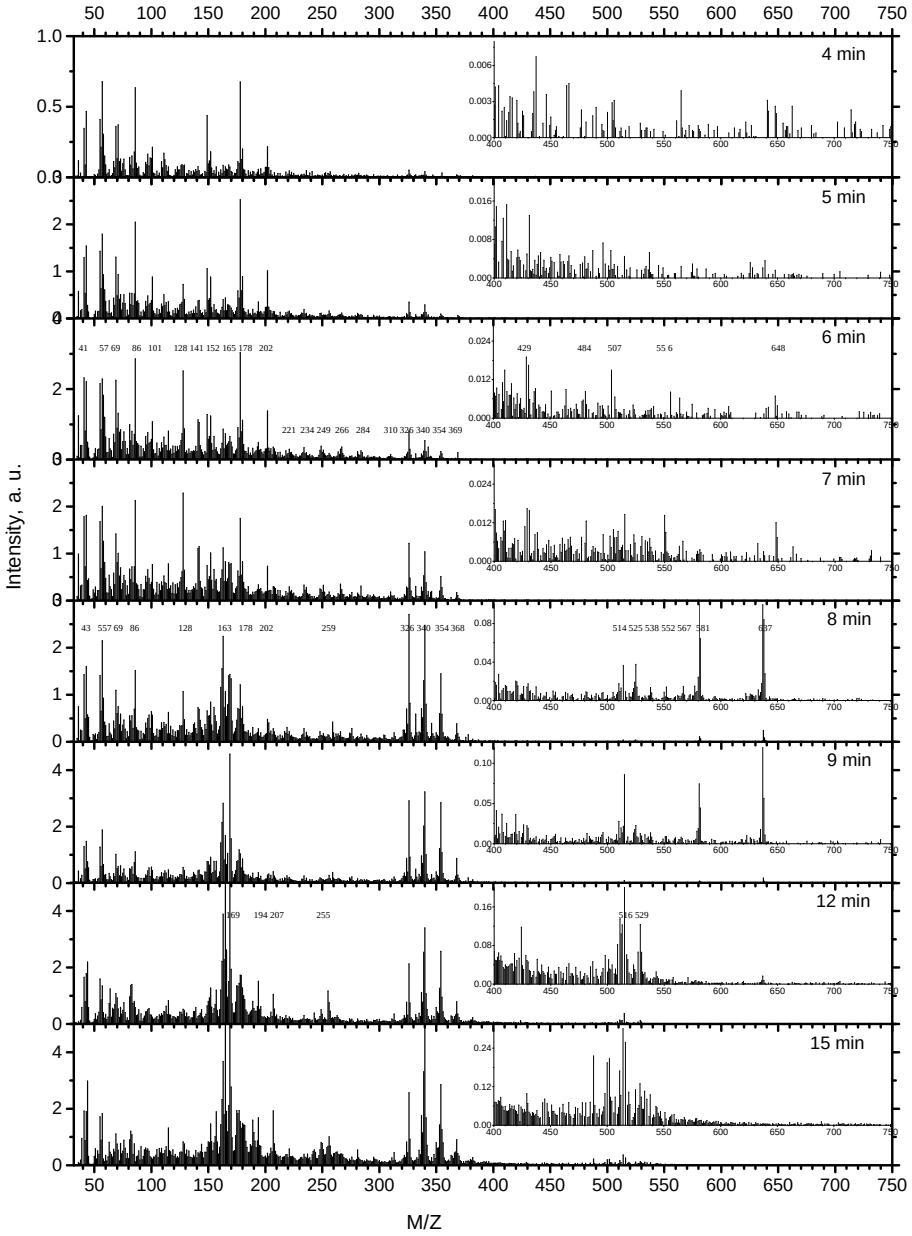

Figure S15. Mass spectra at specified time (C3 feedstock, upper section).

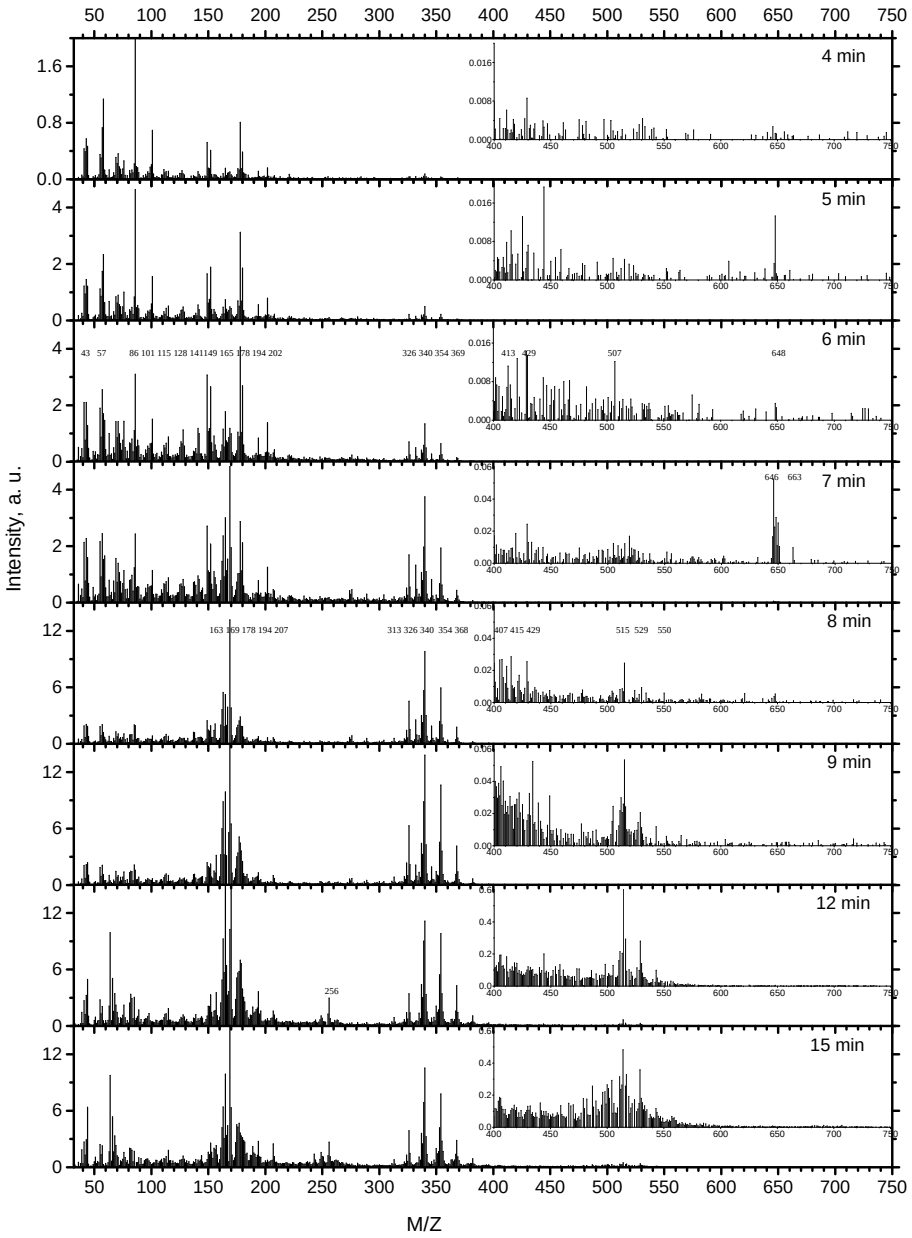

Figure S16. Mass spectra at specified time (C3 feedstock, lower section).

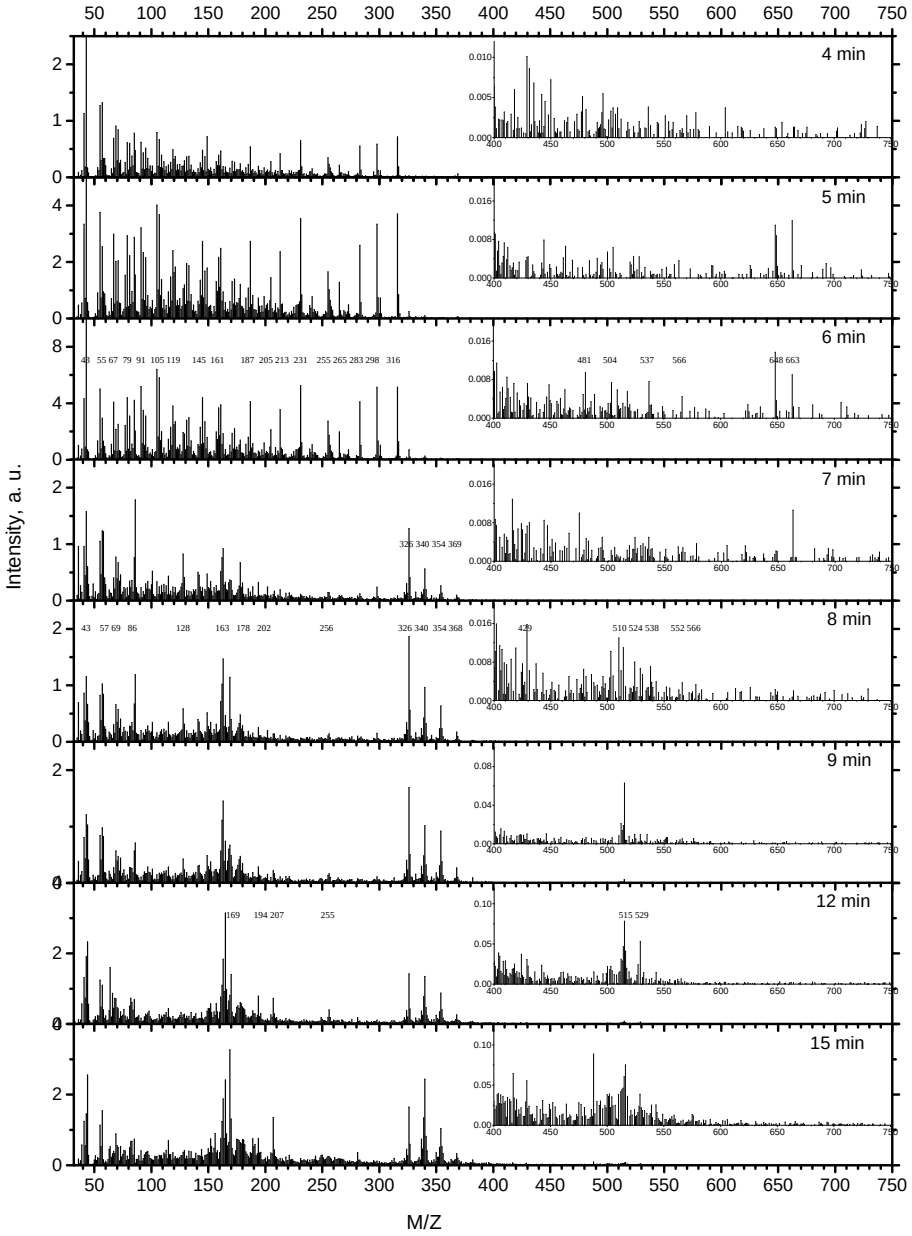

Figure S17. Mass spectra at specified time (C4 feedstock, upper section).

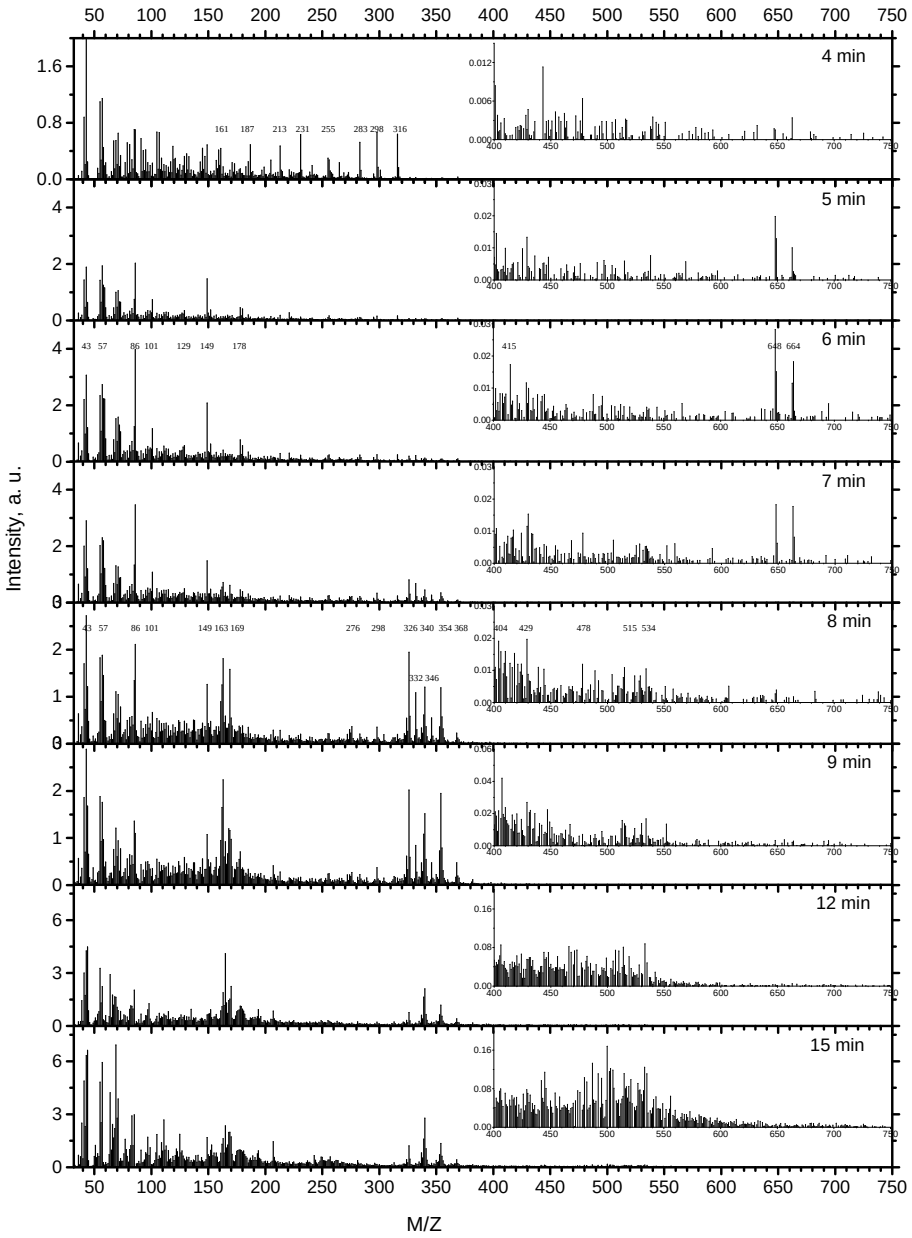

Figure S18. Mass spectra at specified time (C4 feedstock, lower section).

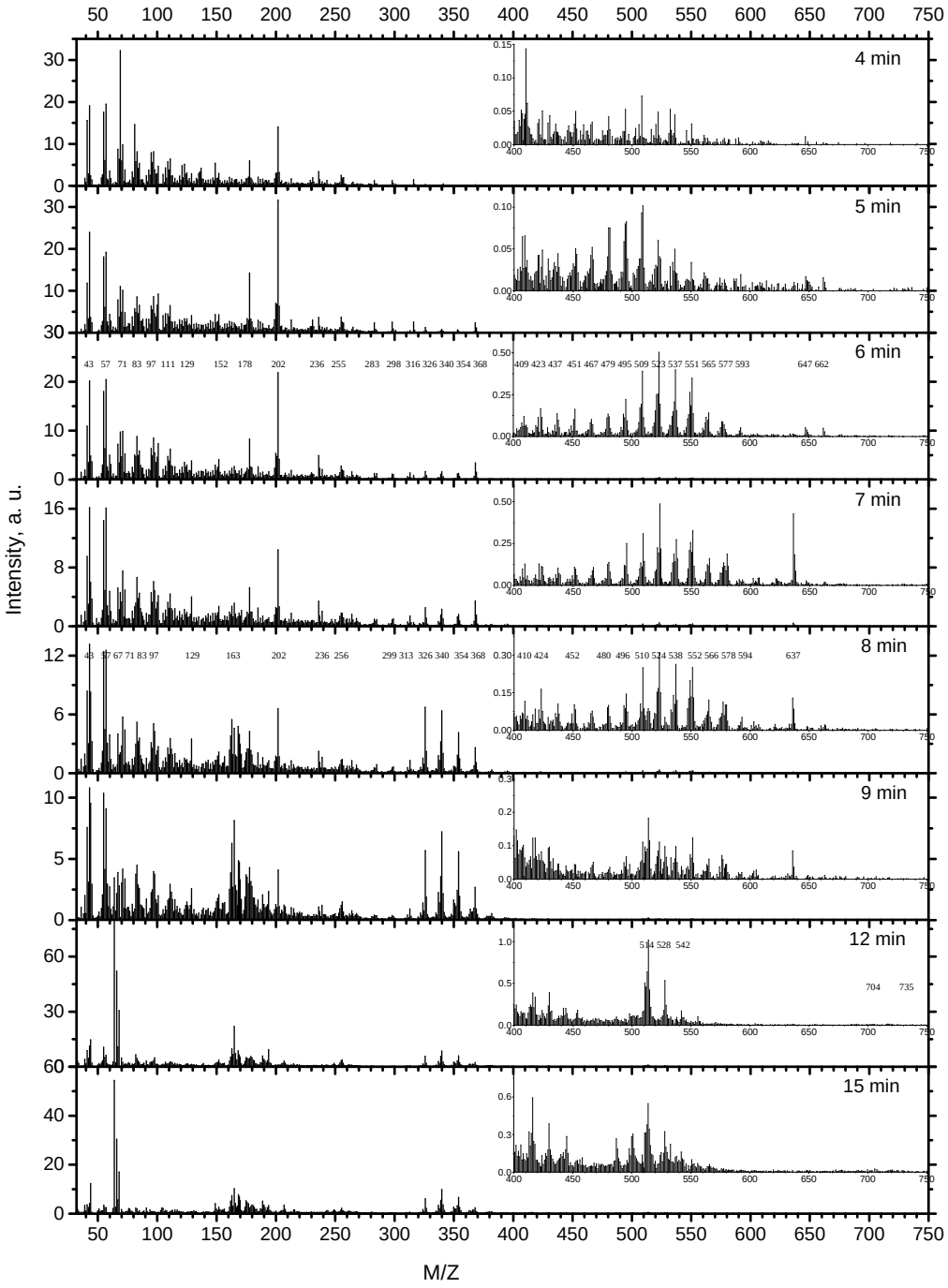

Figure S19. Mass spectra at specified time (methanol feedstock, upper section).

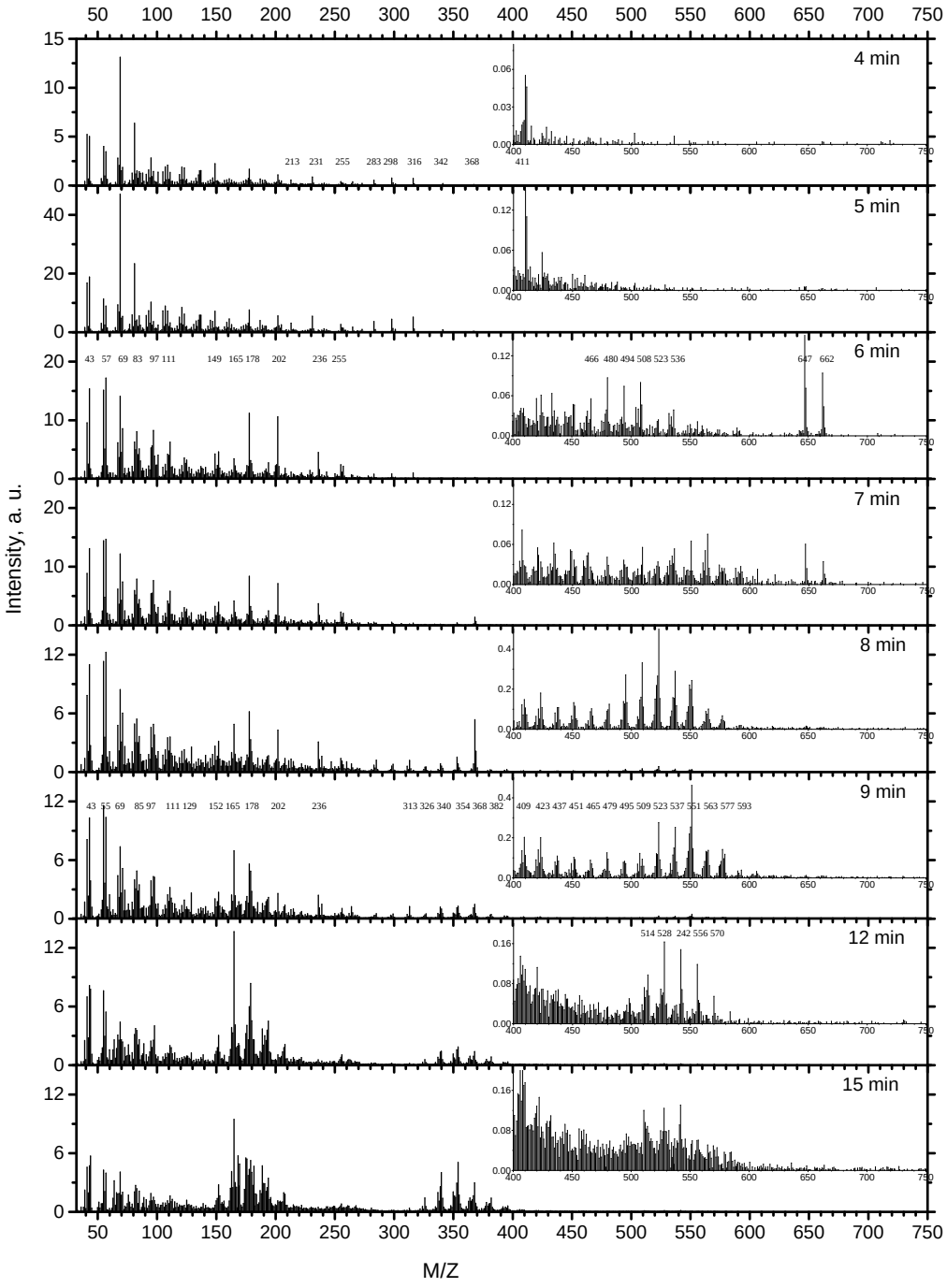

Figure S20. Mass spectra at specified time (methanol feedstock, lower section).

Table S1 Amount of total, soluble and insoluble coke

Position and time	Feed	Total mg/g	Soluble mg/g	Insoluble mg/g	Ratio of soluble	Ratio of insoluble
Upper section 100 min	C2	2.8	2.2	0.6	0.79	0.21
	C2-C3	11.0	3.5	7.5	0.32	0.68
	C2-C4	15.9	10.2	5.7	0.64	0.36
	C3	45.1	20.3	24.8	0.45	0.55
	C4	48.5	14	34.5	0.29	0.71
Lower section 100 min	C2	5.5	6.3	-0.8	1.15	-0.15
	C2-C3	22.7	8.6	14.1	0.38	0.62
	C2-C4	26.4	11.1	15.3	0.42	0.58
	C3	39.4	18.2	21.2	0.46	0.54
	C4	36.3	14.1	22.2	0.39	0.61
Upper section 200 min	C2	6.2	1.8	4.4	0.29	0.71
	C2-C3	18.4	7.9	10.5	0.43	0.57
	C2-C4	29.2	6.9	22.3	0.24	0.76
	C3	70.8	31.3	39.5	0.44	0.56
	C4	79.7	35.9	43.8	0.45	0.55
Lower section 200 min	C2	19.4	5.9	13.5	0.30	0.70
	C2-C3	30.8	8.3	22.5	0.27	0.73
	C2-C4	40.9	14.3	26.6	0.35	0.65
	C3	69.3	18.5	50.8	0.27	0.73
	C4	60.5	22.1	38.4	0.37	0.63

Note: the amount of soluble coke is determined by GC spectra with CCl4 as internal standard. The amount of insoluble coke is calculated by substrating the amount of soluble one form the total. The error is not assessed.

[1] M. Luo, H. Zang, B. Hu, B. Wang, G. Mao, Evolution of confined species and their effects on catalyst deactivation and olefin selectivity in SAPO-34 catalyzed MTO process, RSC Adv. 6 (2016) 17651-17658.