Supporting Information

for

Decomposition of Phenolic Impregnated Carbon Ablator (PICA) as a Function of Temperature and Heating Rate

Brody K. Bessire and Timothy K. Minton*
Department of Chemistry and Biochemistry
103 Chemistry and Biochemistry Building
Montana State University
Bozeman, Montana 59717 United States
*To whom correspondence should be addressed: tminton@montana.edu

Keywords

pyrolysis, PICA, carbon/phenolic ablator, decomposition of phenolic, resole resin

I. Determination of Heating Rate

A representative heating curve is illustrated in Figure S1. The resistance of the sample is initially very high, and the sample temperature increases slowly (blue part of the curve in Figure S1). Near 100 °C, the sample temperature begins to increase approximately linearly, with a heating rate of 3.1 °C s^{-1}, until it reaches the maximum temperature for the experiment, typically around 1200 °C (red part of curve in Figure S1). After the maximum temperature is achieved, the current is decreased from its maximum value to zero within a few seconds, and the temperature decreases quickly as a consequence (green part of curve in Figure S1). The heating rate for each pyrolysis run was calculated over the roughly linear section of the curve. The heating profile shows a "bump" at lower temperatures, in the vicinity of 200 °C, which stems from the inability of the heating program to overcome the large change in sample conductivity in this temperature range during the heating ramp. This small deviation from linearity (as evidenced by a correlation coefficient above 0.99) is not expected to have any measurable effect on the results. Average heating rates of PICA were calculated from the linear portion (red) of the heating profile for each pyrolysis run. Heating rates of 25.0 °C s^{-1} and 12.7 °C s^{-1} were calculated from the average of five runs. Heating rates of 6.1 °C s^{-1} and 3.1 °C s^{-1} were calculated from the average of three runs.

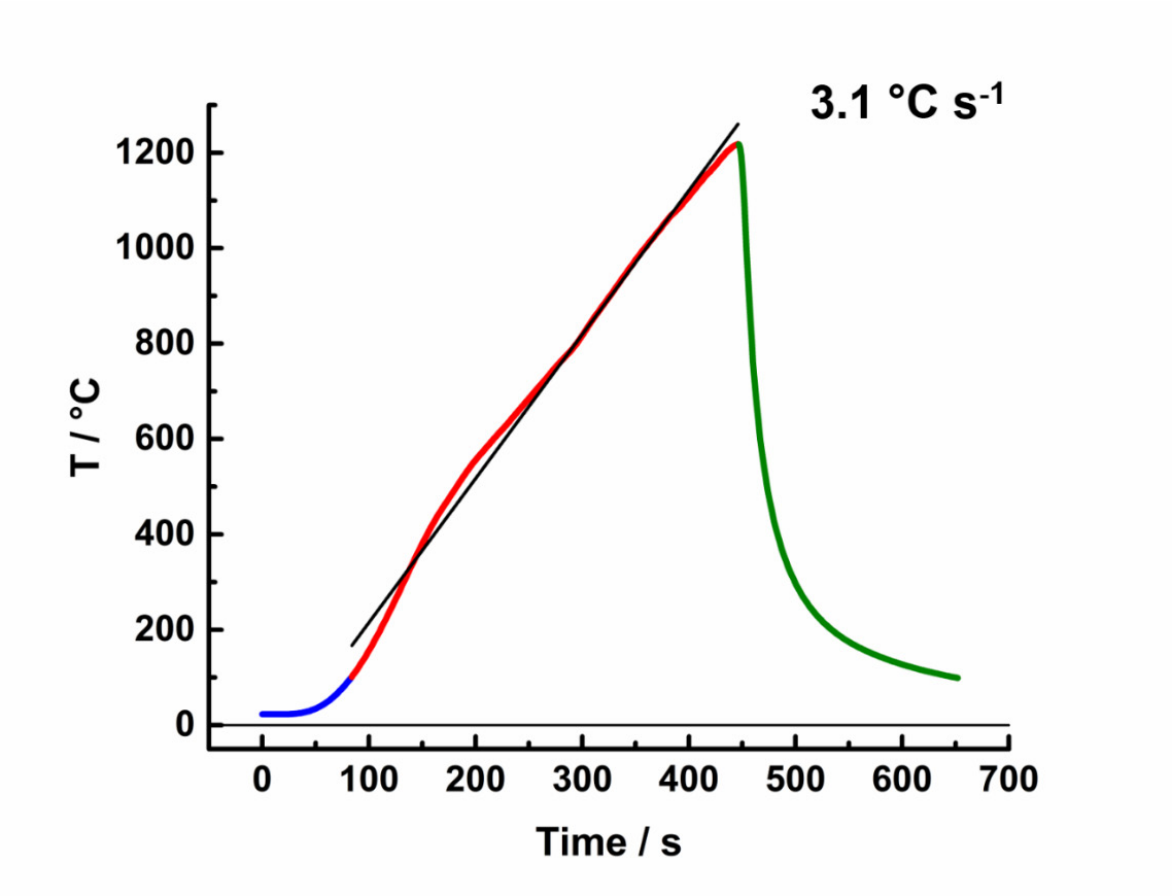

Figure S1. Representative heating profile, with a nominal heating rate of 3.1 °C s^{-1}.

II. Mass Loss Measurements

Mass loss was determined for each heated sample. A copper clamp system was designed to minimize material loss during handling, as PICA is very brittle (Figure S2A). The copper clamps served the purpose of holding the sample to the water-cooled electrodes (with stainless steel screws) and securing the sample when it was not attached to the electrodes. The clamps, screws, and sample were weighed before and after the experiment. The screws that connected the copper clamps were removed after the clamps were secured to the electrodes prior to each experiment and then replaced after the experiment was finished so that the sample could be handled again without any additional mass loss. This procedure allowed for total mass loss measurements of each sample. As seen in Figure S2B, the ends of the sample did not pyrolyze because these regions of the sample were actively cooled by water-cooled clamps. To measure the original mass of the charred portion of the sample, the virgin material at the ends was cut away, and the remaining char was weighed. The total mass lost was added to the charred mass to give the initial mass of the pyrolyzed region of the sample. A Mettler Toledo MS104S NewClassic MF balance, with a precision of 0.1 mg, was used to make each mass measurement.

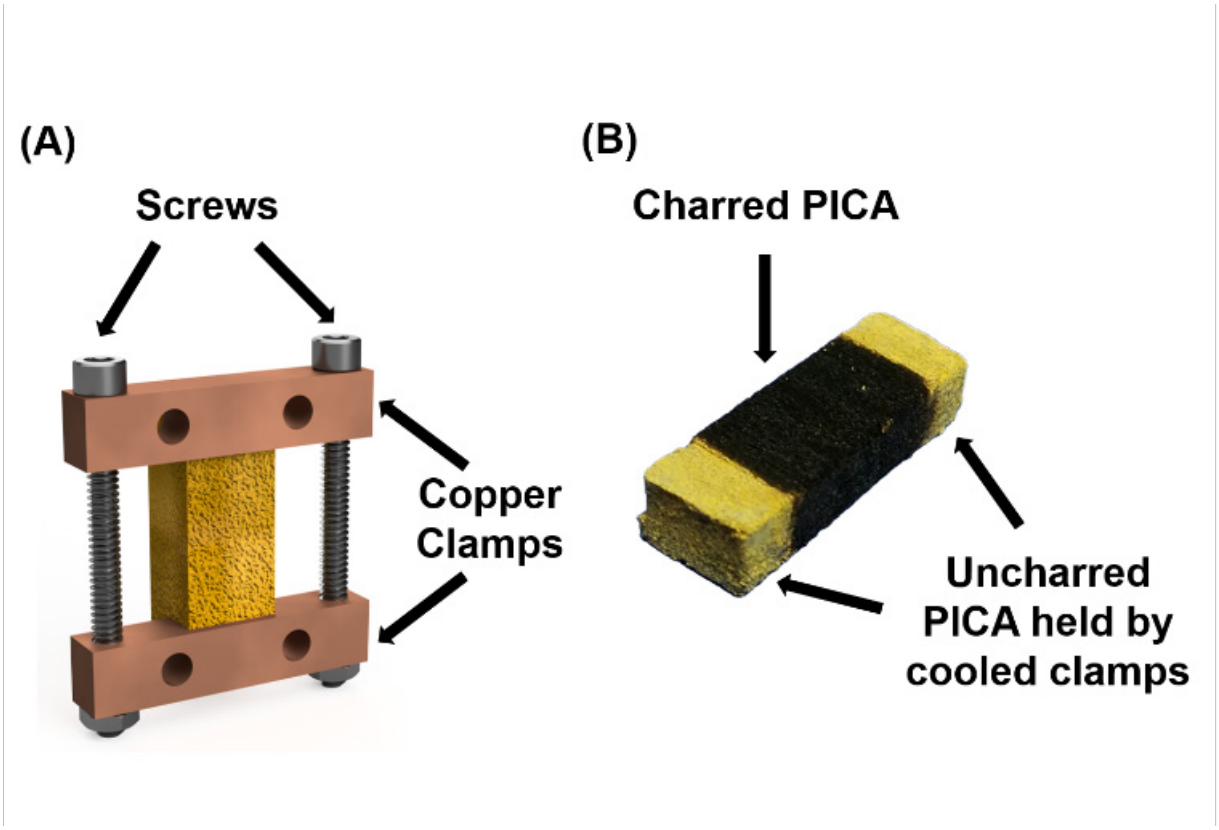

Figure S2. (A) Copper clamp design used to minimize sample loss during handling. (B) PICA sample after heating to ~1200 °C with a nominal rate of 12.7 °C s^{-1}.

III. Data for Pyrolysis of PICA at Four Nominal Heating Rates

A. 25.0 °C s^{-1}

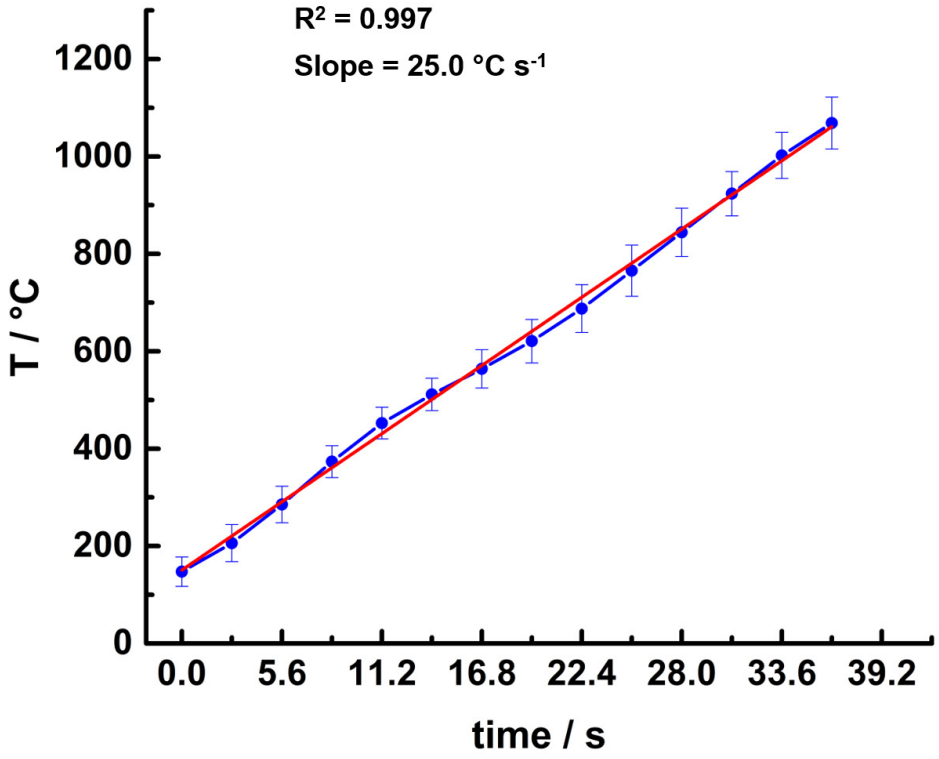

Figure S3. Heating profile for PICA, with a nominal heating rate of 25.0 °C s^{-1}.

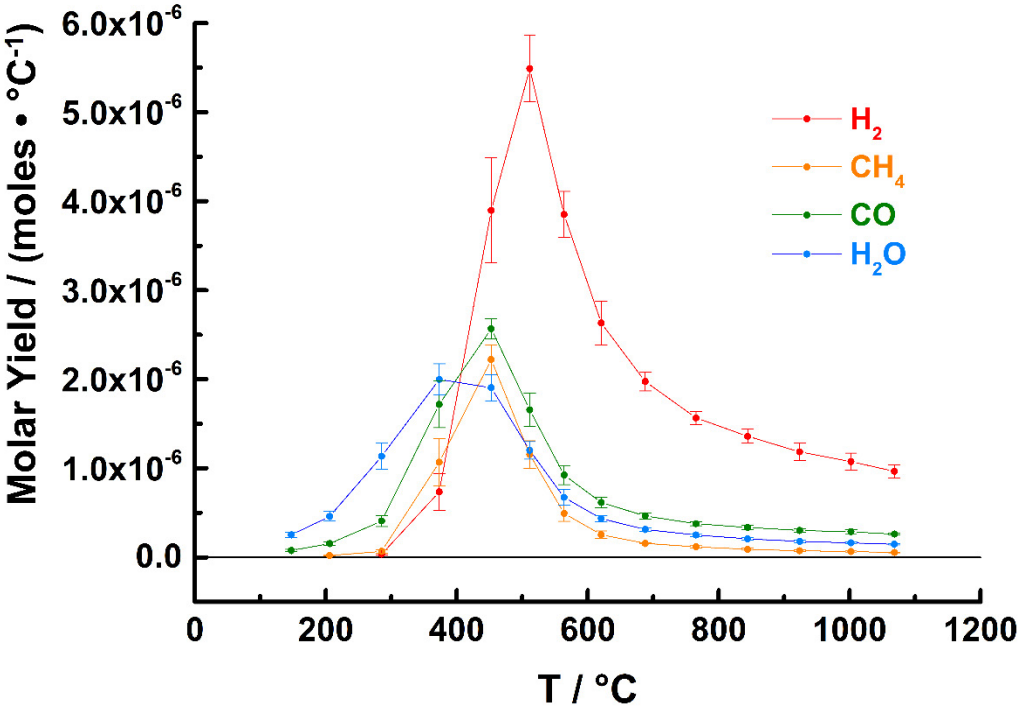

Figure S4. Molar yields of hydrogen, methane, carbon monoxide, and water, measured during the pyrolysis of PICA with a nominal heating rate of 25.0 °C s^{-1}.

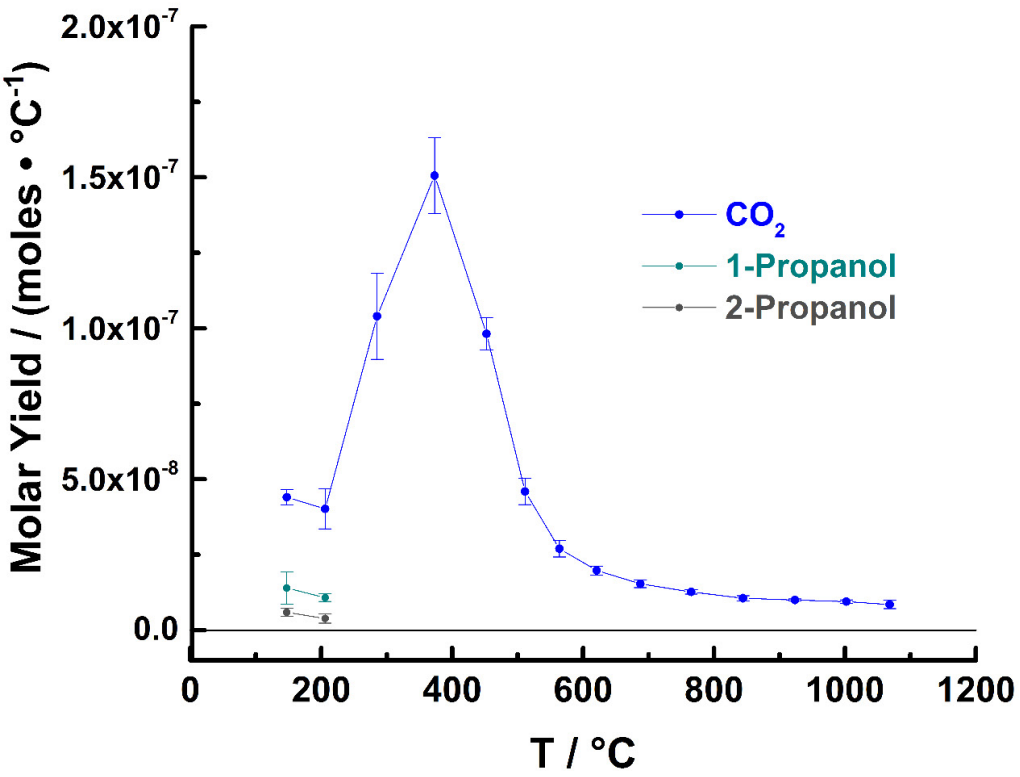

Figure S5. Molar yields of carbon dioxide, 1-propanol, and 2-propanol, measured during the pyrolysis of PICA with a nominal heating rate of 25.0 °C s^{-1}.

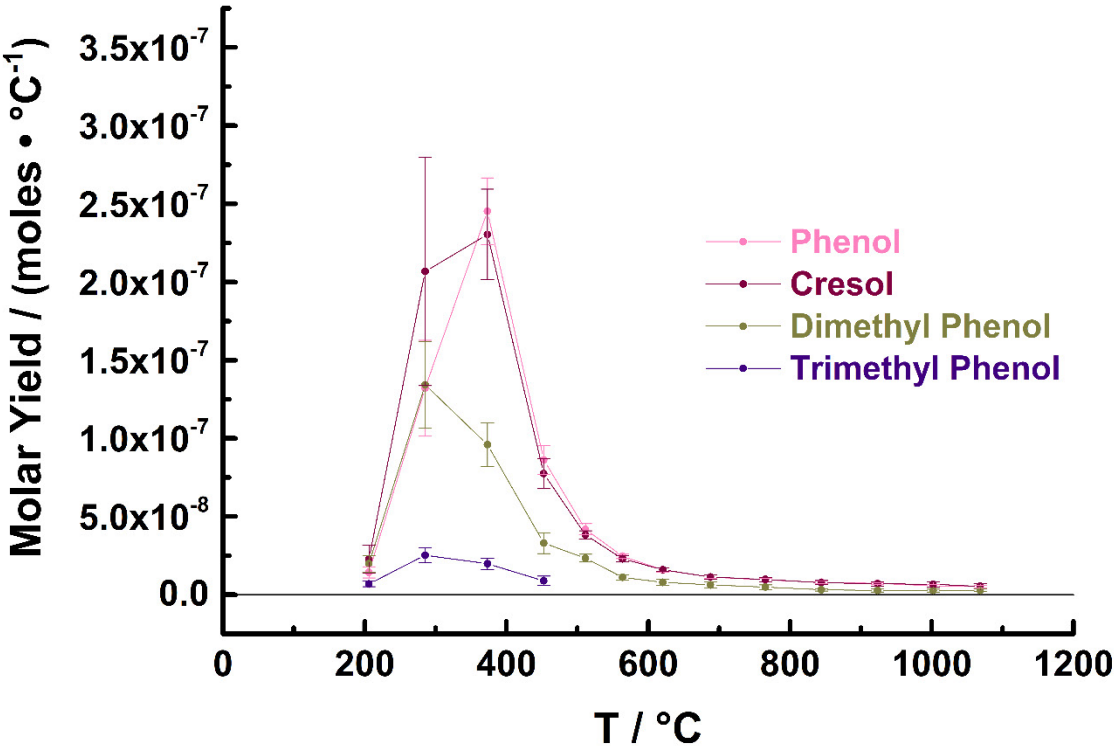

Figure S6. Molar yields of phenol and its derivatives, measured during the pyrolysis of PICA with a nominal heating rate of 25.0 °C s^{-1}.

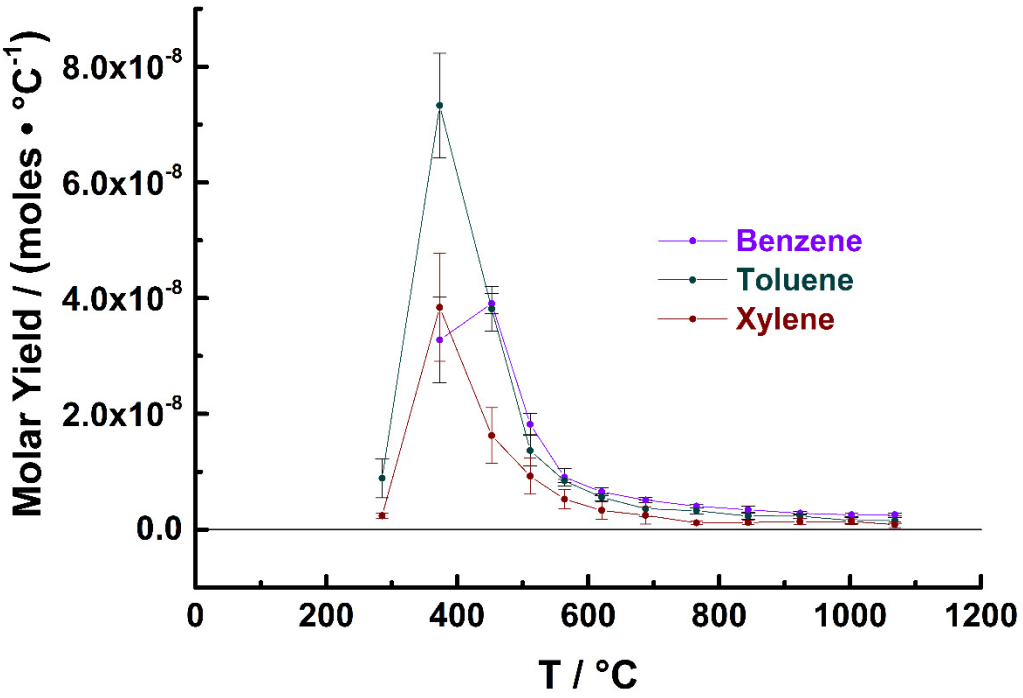

Figure S7. Molar yields of benzene and its derivatives, measured during the pyrolysis of PICA with a nominal heating rate of 25.0 °C s^{-1}.

Table S1. Molar yields of pyrolysis products, measured during the pyrolysis of PICA with a nominal heating rate of 25.0 °C s^{-1}.

25.0 °C s^{-1}		H_2		CH_4		CO		CO_2		Phenol		H_2O		1-Propanol	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
147.5	30.0					7.6E-08	1.4E-08	4.4E-08	2.5E-09			2.5E-07	2.9E-08	1.4E-08	5.3E-09
206.1	38.0			2.0E-08	1.3E-09	1.5E-07	1.9E-08	4.0E-08	6.6E-09	1.4E-08	3.6E-09	4.6E-07	5.4E-08	1.1E-08	1.3E-09
285.4	37.6	3.5E-08	9.5E-09	6.8E-08	2.0E-08	4.1E-07	6.2E-08	1.0E-07	1.4E-08	1.3E-07	3.1E-08	1.1E-06	1.5E-07		
373.3	32.7	7.4E-07	2.0E-07	1.1E-06	2.6E-07	1.7E-06	2.6E-07	1.5E-07	1.3E-08	2.5E-07	2.1E-08	2.0E-06	1.8E-07		
452.6	32.5	3.9E-06	5.9E-07	2.2E-06	1.7E-07	2.6E-06	1.1E-07	9.8E-08	5.3E-09	8.6E-08	9.2E-09	1.9E-06	1.5E-07		
511.5	33.3	5.5E-06	3.7E-07	1.2E-06	1.6E-07	1.7E-06	1.9E-07	4.6E-08	4.4E-09	4.2E-08	3.5E-09	1.2E-06	9.8E-08		
563.8	39.4	3.9E-06	2.6E-07	4.9E-07	8.9E-08	9.2E-07	1.1E-07	2.7E-08	2.8E-09	2.5E-08	1.5E-09	6.7E-07	8.7E-08		
620.8	44.6	2.6E-06	2.5E-07	2.6E-07	4.1E-08	6.2E-07	6.0E-08	2.0E-08	1.4E-09	1.6E-08	1.6E-09	4.4E-07	3.4E-08		
687.6	49.1	2.0E-06	1.1E-07	1.6E-07	5.3E-09	4.6E-07	3.7E-08	1.5E-08	1.3E-09	1.1E-08	1.1E-09	3.1E-07	2.0E-08		
765.4	52.7	1.6E-06	7.5E-08	1.2E-07	1.1E-08	3.8E-07	2.2E-08	1.3E-08	7.0E-10	9.5E-09	1.1E-09	2.5E-07	1.5E-08		
844.3	49.7	1.4E-06	7.7E-08	9.1E-08	9.9E-09	3.4E-07	2.3E-08	1.1E-08	8.2E-10	7.9E-09	6.6E-10	2.1E-07	1.4E-08		
923.7	45.4	1.2E-06	9.9E-08	7.4E-08	9.2E-09	3.0E-07	2.3E-08	1.0E-08	3.5E-10	7.2E-09	4.8E-10	1.8E-07	1.3E-08		
1002.1	47.2	1.1E-06	9.6E-08	6.6E-08	6.0E-09	2.9E-07	2.2E-08	9.4E-09	5.7E-10	5.7E-09	9.6E-10	1.6E-07	1.1E-08		
1068.5	53.3	9.7E-07	7.5E-08	5.4E-08	3.4E-09	2.6E-07	1.2E-08	8.5E-09	1.4E-09	5.2E-09	9.1E-10	1.5E-07	6.1E-09		

25.0 °C s^{-1}		2-Propanol		Xylene		Cresol		Dimethyl Phenol		Trimethyl Phenol		Benzene		Toluene	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
147.5	30.0	5.9E-09	1.3E-09												
206.1	38.0	3.8E-09	1.5E-09			2.3E-08	8.8E-09	2.0E-08	5.4E-09	6.9E-09	1.8E-09				
285.4	37.6			2.4E-09	4.5E-10	2.1E-07	7.3E-08	1.3E-07	2.8E-08	2.5E-08	4.9E-09			8.9E-09	3.4E-09
373.3	32.7			3.8E-08	9.3E-09	2.3E-07	2.9E-08	9.6E-08	1.4E-08	2.0E-08	3.5E-09	3.3E-08	7.4E-09	7.3E-08	9.0E-09
452.6	32.5			1.6E-08	4.8E-09	7.7E-08	9.6E-09	3.3E-08	6.6E-09	8.9E-09	3.0E-09	3.9E-08	1.7E-09	3.8E-08	3.9E-09
511.5	33.3			9.2E-09	3.1E-09	3.8E-08	2.6E-09	2.3E-08	2.5E-09			1.8E-08	1.8E-09	1.4E-08	2.7E-09
563.8	39.4			5.3E-09	1.7E-09	2.3E-08	2.1E-09	1.1E-08	1.8E-09			9.1E-09	1.5E-09	8.4E-09	2.5E-10
620.8	44.6			3.3E-09	1.5E-09	1.6E-08	1.3E-09	8.0E-09	2.0E-09			6.5E-09	6.7E-10	5.6E-09	5.9E-10
687.6	49.1			2.5E-09	1.5E-09	1.1E-08	1.5E-09	6.3E-09	1.9E-09			5.1E-09	4.6E-10	3.6E-09	1.4E-09
765.4	52.7			1.2E-09	2.8E-10	9.8E-09	1.5E-09	4.9E-09	1.4E-09			4.1E-09	3.6E-10	3.3E-09	5.4E-10
844.3	49.7			1.2E-09	3.5E-10	7.7E-09	1.3E-09	3.2E-09	8.1E-10			3.4E-09	6.5E-10	2.4E-09	5.9E-10
923.7	45.4			1.4E-09	4.9E-10	7.0E-09	1.3E-09	2.7E-09	9.0E-10			2.8E-09	3.2E-10	2.3E-09	4.0E-10
1002.1	47.2			1.4E-09	4.8E-10	6.7E-09	1.6E-09	2.7E-09	8.8E-10			2.6E-09	3.4E-10	1.6E-09	5.5E-10
1068.5	53.3			8.8E-10	5.1E-10	5.4E-09	1.6E-09	2.8E-09	9.0E-10			2.6E-09	2.3E-10	1.6E-09	4.8E-10

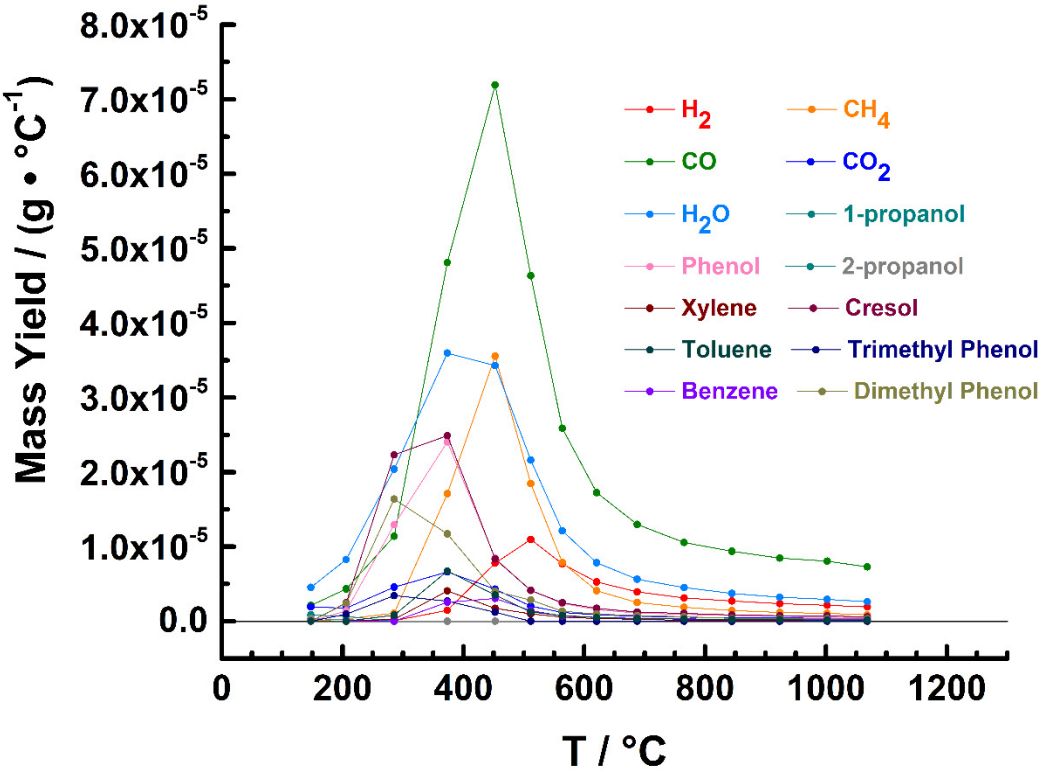

Figure S8. Mass yields of pyrolysis products as a function of nominal heating rate of PICA, measured during the pyrolysis of PICA with a nominal heating rate of 25.0 °C s^{-1}.

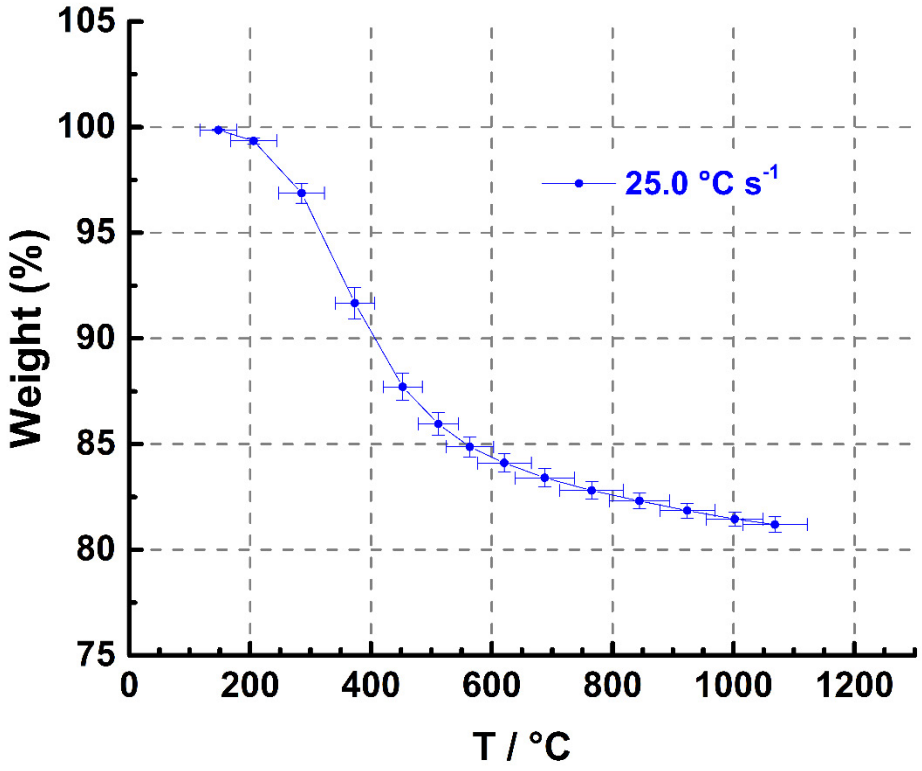

Figure S9. Simulated thermogravimetric analysis (TGA) curve of PICA, with a nominal heating rate of 25.0 °C s^{-1}.

Table S2. TGA data collected with a nominal heating rate of 25.0 °C s^{-1}.

T / °C	± °C	Weight (%)	± Weight (%)
147.5	30.0	99.9	0.0
206.1	38.0	99.3	0.1
285.4	37.6	96.9	0.5
373.3	32.7	91.7	0.8
452.6	32.5	87.7	0.6
511.5	33.3	85.9	0.5
563.8	39.4	84.9	0.5
620.8	44.6	84.1	0.4
687.6	49.1	83.4	0.4
765.4	52.7	82.8	0.4
844.3	49.7	82.3	0.4
923.7	45.4	81.9	0.3
1002.1	47.2	81.5	0.3
1068.5	53.3	81.2	0.4
	SD (1σ)		SD (1σ)

B. 12.7 °C s^{-1}

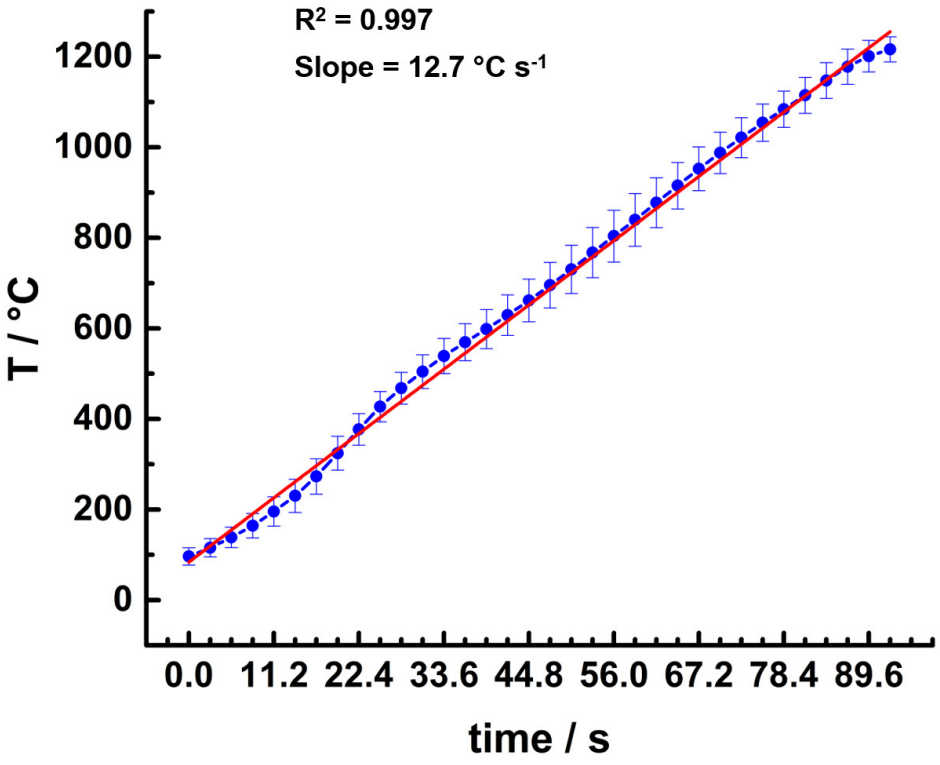

Figure S10. Heating profile for PICA, with a nominal heating rate of 12.7 °C s^{-1}.

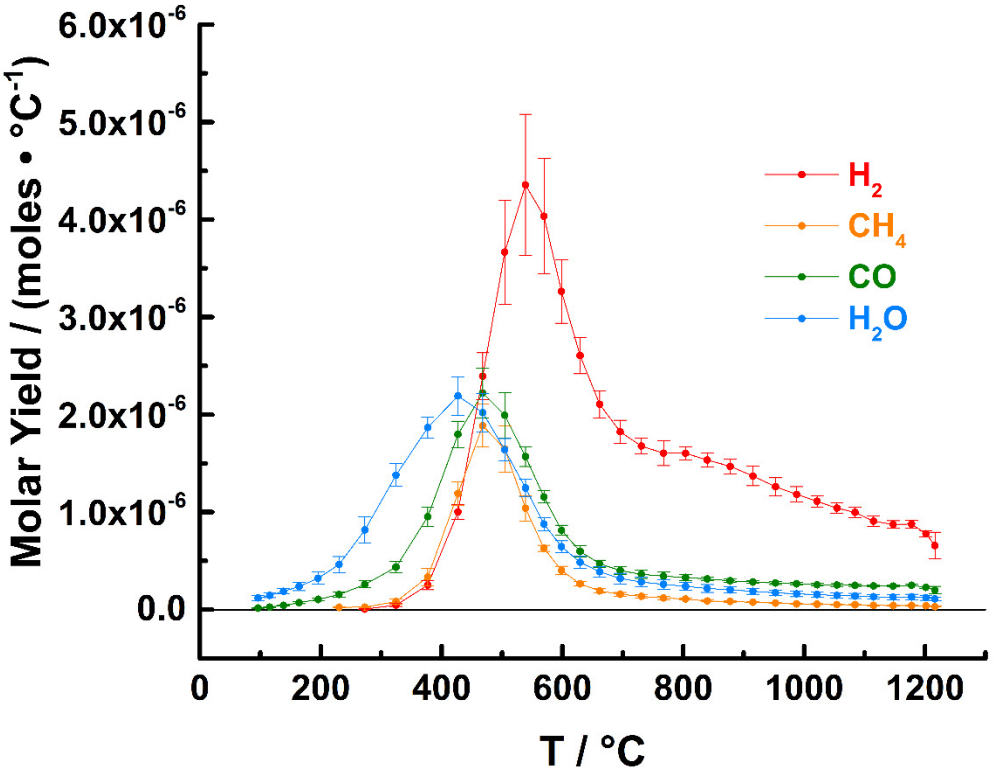

Figure S11. Molar yields of hydrogen, methane, carbon monoxide, and water, measured during the pyrolysis of PICA with a nominal heating rate of 12.7 °C s^{-1}.

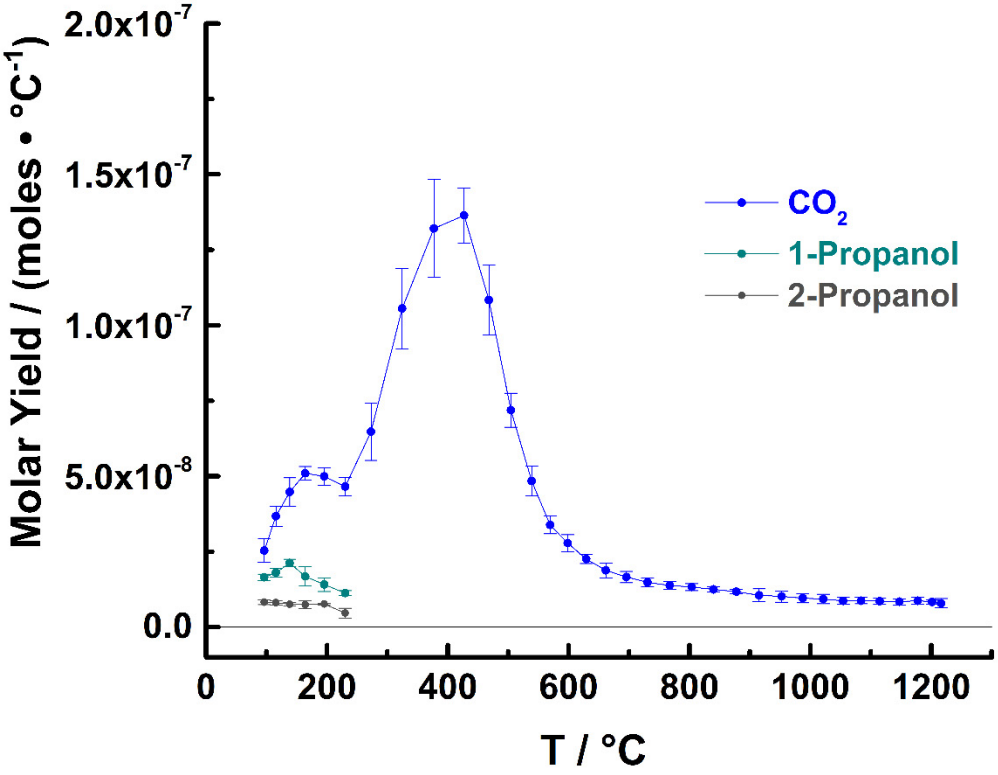

Figure S12. Molar yields of carbon dioxide, 1-propanol, and 2-propanol, measured during the pyrolysis of PICA with a nominal heating rate of 12.7 °C s^{-1}.

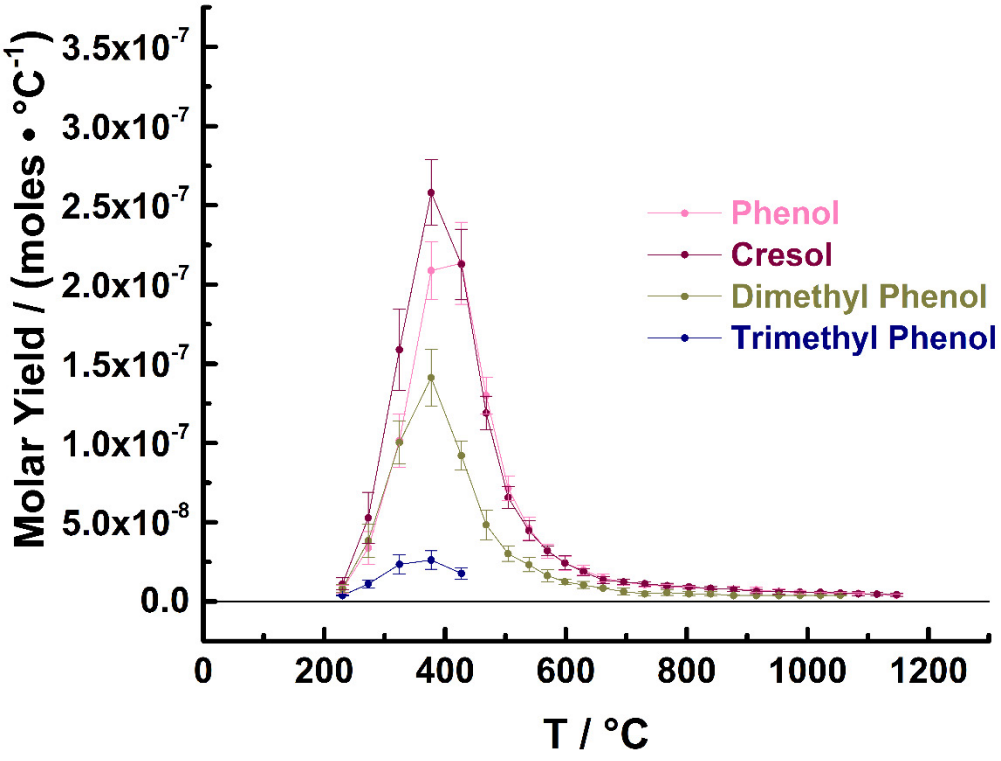

Figure S13. Molar yields of phenol and its derivatives, measured during the pyrolysis of PICA with a nominal heating rate of 12.7 °C s^{-1}.

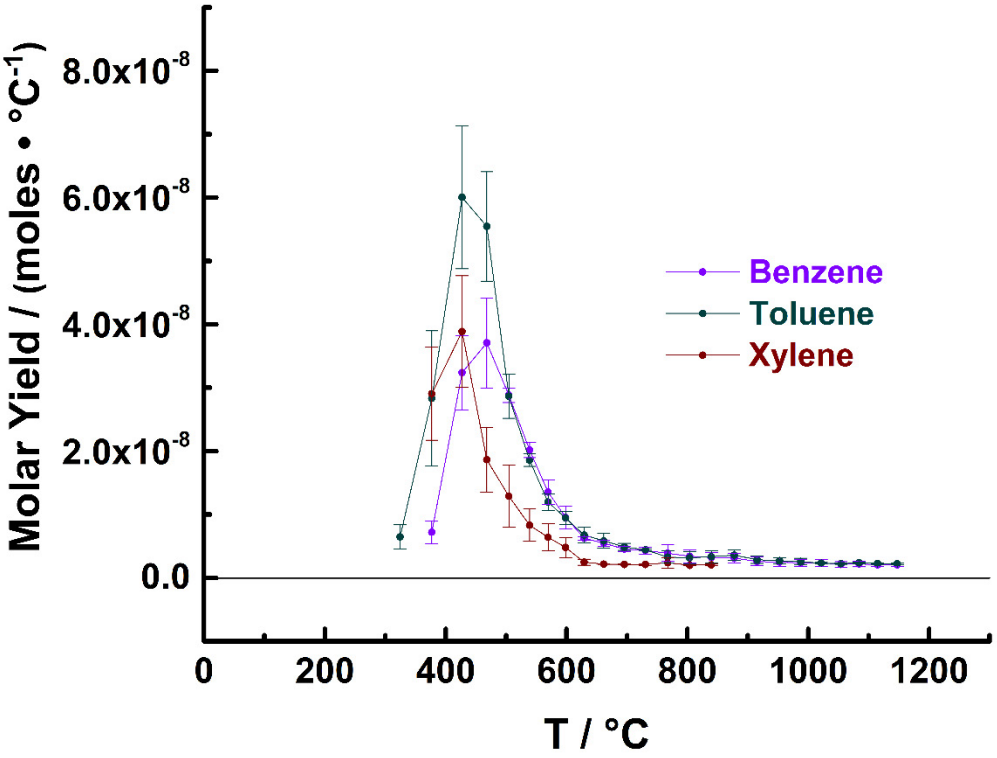

Figure S14. Molar yields of benzene and its derivatives, measured during the pyrolysis of PICA with a nominal heating rate of 12.7 °C s^{-1}.

Table S3. Molar yields of pyrolysis products, measured during the pyrolysis of PICA with a nominal heating rate of 12.7 °C s^{-1}.

12.7 °C s^{-1}		H_2		CH_4		CO		CO_2		Phenol		H_2O		1-Propanol	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
96.4	19.2					1.8E-08	2.1E-09	2.5E-08	3.8E-09			1.2E-07	2.6E-08	1.7E-08	1.1E-09
115.5	20.3					2.7E-08	3.9E-09	3.7E-08	3.3E-09			1.5E-07	2.4E-08	1.8E-08	1.5E-09
138.5	22.7					4.4E-08	5.8E-09	4.5E-08	4.7E-09			1.9E-07	2.8E-08	2.1E-08	1.3E-09
164.2	27.0					7.2E-08	1.1E-08	5.1E-08	2.3E-09			2.4E-07	4.2E-08	1.7E-08	3.2E-09
195.6	32.3					1.0E-07	1.2E-08	5.0E-08	2.8E-09			3.2E-07	6.2E-08	1.4E-08	2.3E-09
230.2	36.6			2.5E-08	2.8E-09	1.6E-07	2.4E-08	4.7E-08	3.1E-09	7.8E-09	2.5E-09	4.6E-07	8.2E-08	1.1E-08	8.4E-10
273.0	39.1	5.7E-09	1.6E-09	2.6E-08	2.9E-09	2.6E-07	3.5E-08	6.5E-08	9.6E-09	3.4E-08	1.0E-08	8.2E-07	1.4E-07		
324.5	37.6	4.7E-08	1.3E-08	8.2E-08	2.6E-08	4.4E-07	5.8E-08	1.1E-07	1.3E-08	1.0E-07	1.7E-08	1.4E-06	1.2E-07		
377.0	34.8	2.5E-07	4.7E-08	3.4E-07	8.9E-08	9.5E-07	1.0E-07	1.3E-07	1.6E-08	2.1E-07	1.8E-08	1.9E-06	1.1E-07		
427.1	33.5	1.0E-06	7.4E-08	1.2E-06	1.2E-07	1.8E-06	1.4E-07	1.4E-07	9.1E-09	2.1E-07	2.6E-08	2.2E-06	2.0E-07		
467.9	35.0	2.4E-06	2.4E-07	1.9E-06	2.2E-07	2.2E-06	2.6E-07	1.1E-07	1.2E-08	1.3E-07	1.2E-08	2.0E-06	1.9E-07		
504.5	37.4	3.7E-06	5.4E-07	1.6E-06	2.4E-07	2.0E-06	2.3E-07	7.2E-08	5.7E-09	7.1E-08	7.9E-09	1.6E-06	1.2E-07		
539.0	38.9	4.4E-06	7.2E-07	1.0E-06	1.3E-07	1.6E-06	1.0E-07	4.8E-08	4.9E-09	4.6E-08	7.1E-09	1.2E-06	9.0E-08		
569.4	40.8	4.0E-06	5.9E-07	6.3E-07	3.1E-08	1.2E-06	6.2E-08	3.4E-08	2.9E-09	3.2E-08	4.4E-09	8.8E-07	6.7E-08		
598.5	43.1	3.3E-06	3.2E-07	4.0E-07	4.4E-08	8.1E-07	5.3E-08	2.8E-08	2.8E-09	2.4E-08	4.5E-09	6.5E-07	6.0E-08		
629.3	44.8	2.6E-06	1.9E-07	2.7E-07	2.2E-08	6.0E-07	5.7E-08	2.3E-08	1.5E-09	2.0E-08	3.1E-09	4.9E-07	6.2E-08		
661.7	47.2	2.1E-06	1.4E-07	1.9E-07	2.2E-08	4.7E-07	3.6E-08	1.9E-08	2.5E-09	1.5E-08	2.4E-09	3.9E-07	5.4E-08		
695.6	50.2	1.8E-06	1.2E-07	1.6E-07	1.8E-08	4.0E-07	3.8E-08	1.7E-08	1.9E-09	1.2E-08	2.0E-09	3.2E-07	5.3E-08		
730.5	53.4	1.7E-06	8.2E-08	1.4E-07	1.9E-08	3.6E-07	4.2E-08	1.5E-08	1.4E-09	1.1E-08	1.8E-09	2.8E-07	5.1E-08		
767.5	55.4	1.6E-06	1.3E-07	1.2E-07	1.8E-08	3.5E-07	4.2E-08	1.4E-08	1.3E-09	9.6E-09	1.2E-09	2.6E-07	5.1E-08		
803.8	57.1	1.6E-06	6.7E-08	1.1E-07	1.1E-08	3.3E-07	3.0E-08	1.3E-08	1.2E-09	8.8E-09	9.5E-10	2.4E-07	4.1E-08		
839.6	58.2	1.5E-06	7.0E-08	8.9E-08	7.6E-09	3.1E-07	1.7E-08	1.3E-08	8.6E-10	8.0E-09	1.4E-09	2.2E-07	4.1E-08		
877.8	54.9	1.5E-06	7.6E-08	8.4E-08	6.9E-09	3.0E-07	1.6E-08	1.2E-08	7.3E-10	7.9E-09	1.5E-09	2.0E-07	3.3E-08		
915.2	51.4	1.4E-06	1.0E-07	7.6E-08	4.2E-09	2.8E-07	1.3E-08	1.1E-08	2.1E-09	7.4E-09	1.7E-09	1.9E-07	2.9E-08		
952.6	48.4	1.3E-06	9.2E-08	6.7E-08	3.9E-09	2.7E-07	1.4E-08	1.0E-08	1.9E-09	6.3E-09	1.6E-09	1.7E-07	2.8E-08		
987.7	45.8	1.2E-06	7.9E-08	6.0E-08	4.8E-09	2.7E-07	1.6E-08	9.6E-09	1.5E-09	6.0E-09	1.2E-09	1.6E-07	2.8E-08		
1021.4	44.1	1.1E-06	5.7E-08	5.6E-08	4.7E-09	2.6E-07	1.4E-08	9.3E-09	1.6E-09	5.4E-09	4.4E-10	1.5E-07	2.5E-08		
1054.3	41.2	1.0E-06	5.1E-08	5.1E-08	3.4E-09	2.5E-07	1.5E-08	8.7E-09	1.1E-09	4.9E-09	1.1E-09	1.5E-07	2.7E-08		
1084.1	40.0	1.0E-06	5.2E-08	4.9E-08	3.8E-09	2.5E-07	1.2E-08	8.8E-09	1.0E-09	5.1E-09	4.8E-10	1.4E-07	2.7E-08		
1114.8	39.8	9.1E-07	5.1E-08	4.4E-08	3.7E-09	2.4E-07	1.1E-08	8.6E-09	1.0E-09	4.7E-09	1.0E-09	1.3E-07	2.5E-08		
1147.5	39.5	8.7E-07	3.9E-08	4.3E-08	2.6E-09	2.4E-07	1.0E-08	8.4E-09	1.0E-09	4.0E-09	7.1E-10	1.3E-07	2.4E-08		
1178.0	38.8	8.8E-07	3.8E-08	4.3E-08	2.5E-09	2.5E-07	9.1E-09	8.8E-09	1.1E-09			1.3E-07	2.8E-08		
1201.5	34.8	7.8E-07	3.3E-08	3.8E-08	2.5E-09	2.3E-07	9.6E-09	8.3E-09	7.0E-10			1.2E-07	2.7E-08		
1216.4	27.8	6.6E-07	1.4E-07	3.2E-08	5.9E-09	2.0E-07	3.8E-08	7.9E-09	1.6E-09			1.1E-07	2.0E-08		

12.7 °C s^{-1}		2-Propanol		Xylene		Cresol		Dimethyl Phenol		Trimethyl Phenol		Benzene		Toluene	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
96.4	19.2	8.3E-09	8.1E-10												
115.5	20.3	8.1E-09	7.3E-10												
138.5	22.7	7.6E-09	6.3E-10												
164.2	27.0	7.5E-09	1.3E-09												
195.6	32.3	7.7E-09	2.7E-10												
230.2	36.6	4.7E-09	1.6E-09			1.1E-08	3.8E-09	8.3E-09	2.3E-09	3.8E-09	1.1E-10				
273.0	39.1					5.3E-08	1.6E-08	3.8E-08	1.1E-08	1.1E-08	2.6E-09				
324.5	37.6					1.6E-07	2.6E-08	1.0E-07	1.4E-08	2.3E-08	6.1E-09			6.5E-09	1.9E-09
377.0	34.8			2.9E-08	7.3E-09	2.6E-07	2.1E-08	1.4E-07	1.8E-08	2.6E-08	5.8E-09	7.2E-09	1.8E-09	2.8E-08	1.1E-08
427.1	33.5			3.9E-08	8.8E-09	2.1E-07	2.2E-08	9.2E-08	9.1E-09	1.8E-08	3.6E-09	3.2E-08	5.9E-09	6.0E-08	1.1E-08
467.9	35.0			1.9E-08	5.1E-09	1.2E-07	1.1E-08	4.8E-08	9.3E-09			3.7E-08	7.1E-09	5.5E-08	8.6E-09
504.5	37.4			1.3E-08	4.9E-09	6.6E-08	6.8E-09	3.0E-08	4.8E-09			2.9E-08	1.2E-09	2.9E-08	3.5E-09
539.0	38.9			8.3E-09	2.5E-09	4.5E-08	6.5E-09	2.3E-08	4.4E-09			2.0E-08	1.2E-09	1.9E-08	9.7E-10
569.4	40.8			6.4E-09	2.1E-09	3.2E-08	3.1E-09	1.6E-08	3.9E-09			1.4E-08	1.9E-09	1.2E-08	1.3E-09
598.5	43.1			4.8E-09	1.6E-09	2.4E-08	4.4E-09	1.2E-08	1.8E-09			9.6E-09	1.8E-09	9.4E-09	1.1E-09
629.3	44.8			2.5E-09	4.8E-10	1.9E-08	2.2E-09	1.0E-08	2.2E-09			6.2E-09	2.8E-10	6.8E-09	1.3E-09
661.7	47.2			2.2E-09	2.3E-11	1.4E-08	2.1E-09	8.3E-09	9.0E-11			5.5E-09	4.5E-10	5.8E-09	1.2E-09
695.6	50.2			2.1E-09	7.1E-11	1.2E-08	1.5E-09	6.2E-09	2.2E-09			4.5E-09	4.3E-10	4.9E-09	5.5E-10
730.5	53.4			2.1E-09	1.5E-10	1.1E-08	1.4E-09	4.9E-09	1.4E-09			4.3E-09	5.2E-10	4.4E-09	1.3E-10
767.5	55.4			2.4E-09	8.3E-10	1.0E-08	1.5E-09	5.7E-09	1.8E-09			3.9E-09	1.3E-09	3.3E-09	9.8E-10
803.8	57.1			2.0E-09	8.3E-11	9.2E-09	1.2E-09	4.8E-09	1.4E-09			3.4E-09	1.1E-09	3.2E-09	9.5E-10
839.6	58.2			2.1E-09	1.7E-10	8.4E-09	9.6E-10	4.8E-09	1.4E-09			3.2E-09	8.0E-10	3.3E-09	9.6E-10
877.8	54.9					7.7E-09	1.2E-09	3.9E-09	6.8E-11			3.1E-09	8.0E-10	3.6E-09	8.2E-10
915.2	51.4					6.4E-09	1.3E-09	3.9E-09	8.3E-11			2.6E-09	7.0E-10	2.9E-09	6.0E-10
952.6	48.4					6.3E-09	1.4E-09	3.9E-09	1.1E-10			2.5E-09	7.3E-10	2.7E-09	4.6E-10
987.7	45.8					6.0E-09	4.3E-10	3.9E-09	9.7E-11			2.4E-09	5.5E-10	2.6E-09	5.2E-10
1021.4	44.1					5.8E-09	8.2E-10	3.9E-09	1.2E-10			2.4E-09	5.7E-10	2.3E-09	1.4E-10
1054.3	41.2					5.5E-09	8.7E-10	3.8E-09	1.1E-10			2.1E-09	4.2E-10	2.2E-09	1.2E-10
1084.1	40.0					4.8E-09	1.2E-09					2.2E-09	4.4E-10	2.4E-09	1.7E-10
1114.8	39.8					4.6E-09	1.1E-09					2.1E-09	2.7E-10	2.2E-09	1.1E-10
1147.5	39.5					4.4E-09	1.1E-09					2.1E-09	2.5E-10	2.2E-09	1.3E-10
1178.0	38.8														
1201.5	34.8														
1216.4	27.8														

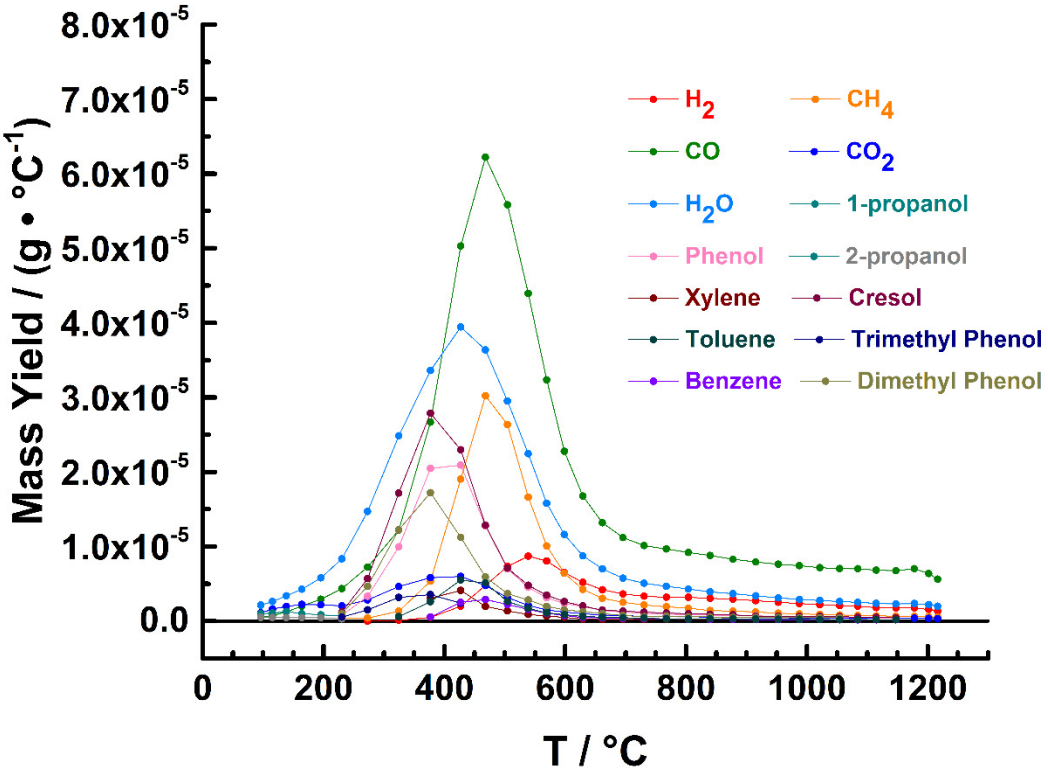

Figure S15. Mass yields of pyrolysis products as a function of nominal heating rate of PICA, measured during the pyrolysis of PICA with a nominal heating rate of 12.7 °C s^{-1}.

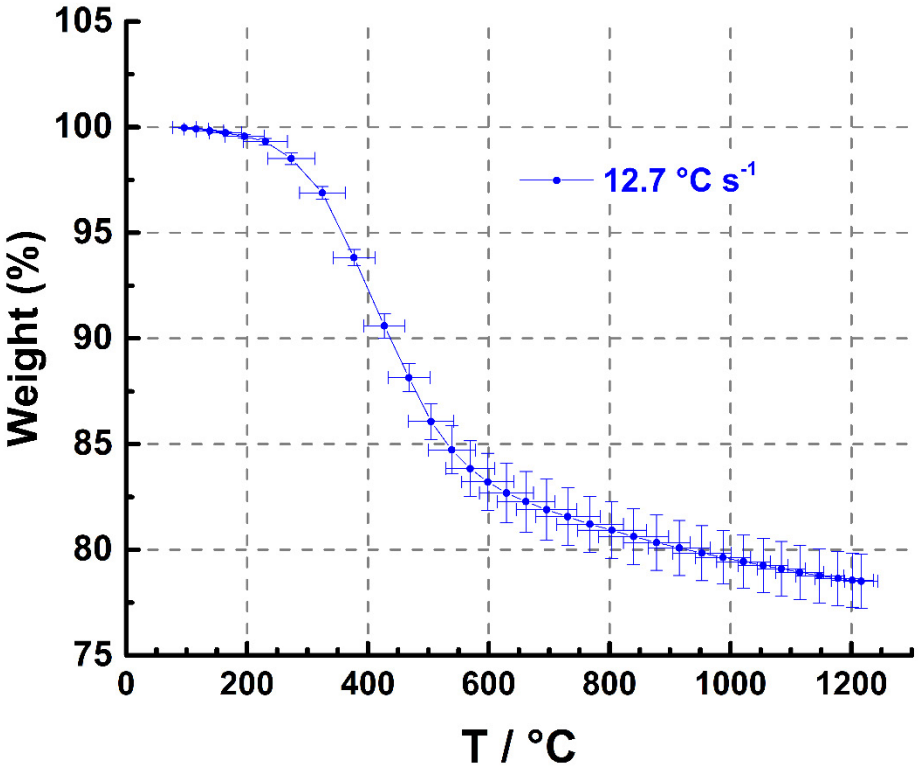

Figure S16. Simulated thermogravimetric analysis (TGA) curve of PICA with a nominal heating rate of 12.7 °C s^{-1}.

Table S4. TGA data collected with a nominal heating rate of 12.7°C s^{-1}.

T / °C	± °C	% Weight	± % Weight
96.4	19.2	100.0	0.0
115.5	20.3	99.9	0.0
138.5	22.7	99.8	0.0
164.2	27.0	99.7	0.1
195.6	32.3	99.6	0.1
230.2	36.6	99.3	0.2
273.0	39.1	98.5	0.3
324.5	37.6	96.9	0.3
377.0	34.8	93.8	0.4
427.1	33.5	90.6	0.6
467.9	35.0	88.1	0.7
504.5	37.4	86.1	0.8
539.0	38.9	84.7	1.1
569.4	40.8	83.8	1.3
598.5	43.1	83.2	1.4
629.3	44.8	82.7	1.4
661.7	47.2	82.3	1.4
695.6	50.2	81.9	1.4
730.5	53.4	81.6	1.4
767.5	55.4	81.2	1.3
803.8	57.1	80.9	1.3
839.6	58.2	80.6	1.3
877.8	54.9	80.3	1.3
915.2	51.4	80.1	1.3
952.6	48.4	79.8	1.3
987.7	45.8	79.6	1.3
1021.4	44.1	79.4	1.3
1054.3	41.2	79.3	1.3
1084.1	40.0	79.1	1.3
1114.8	39.8	78.9	1.3
1147.5	39.5	78.8	1.3
1178.0	38.8	78.6	1.3
1201.5	34.8	78.6	1.3
1216.4	27.8	78.5	1.3
	SD (1σ)		SD (1σ)

C. 6.1 °C s^{-1}

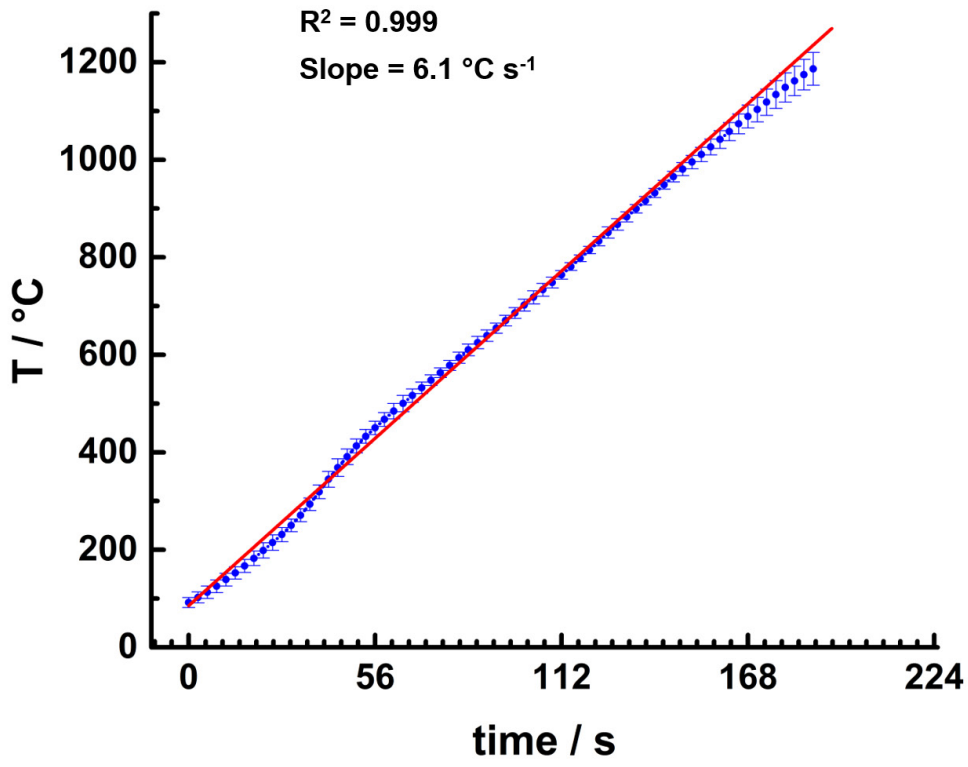

Figure S17. Heating profile for PICA, with a nominal heating rate of 6.1 °C s^{-1}.

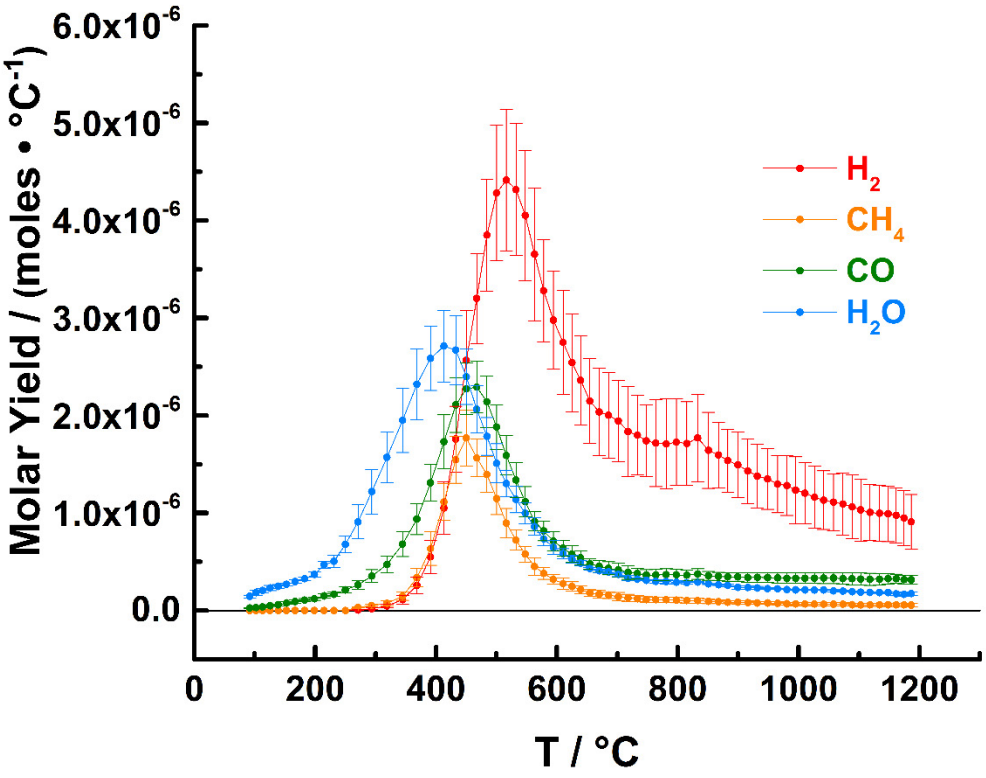

Figure S18. Molar yields of hydrogen, methane, carbon monoxide, and water, measured during the pyrolysis of PICA with a nominal heating rate of 6.1 °C s^{-1}.

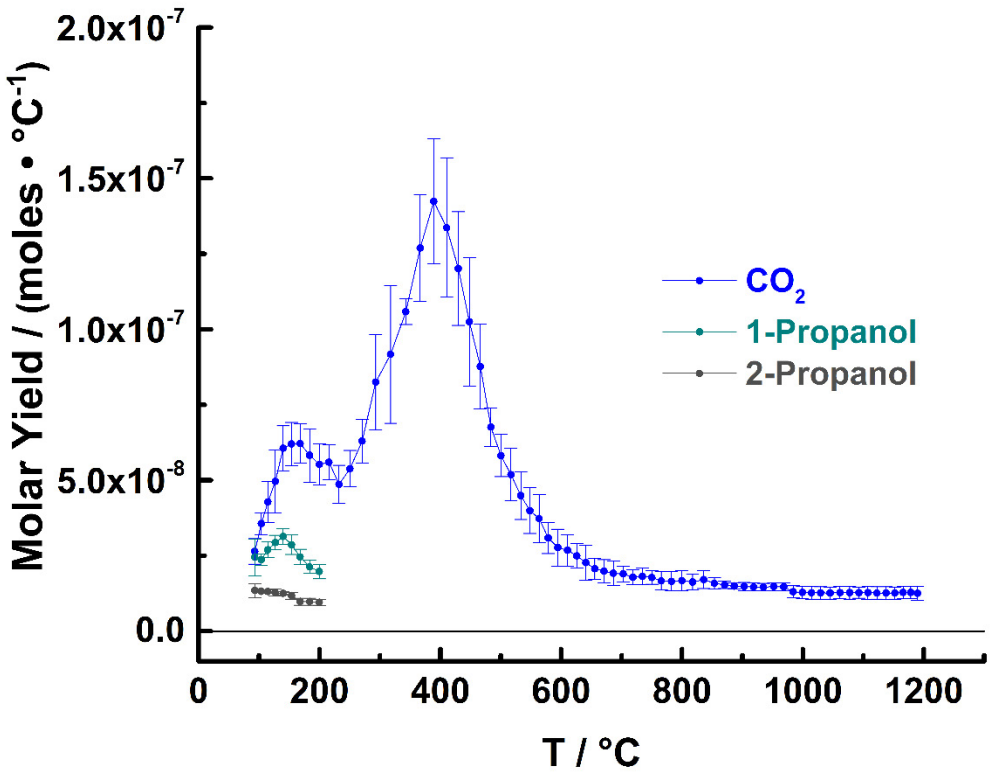

Figure S19. Molar yields of carbon dioxide, 1-propanol, and 2-propanol, measured during the pyrolysis of PICA, with at a nominal heating rate of 6.1 °C s^{-1}.

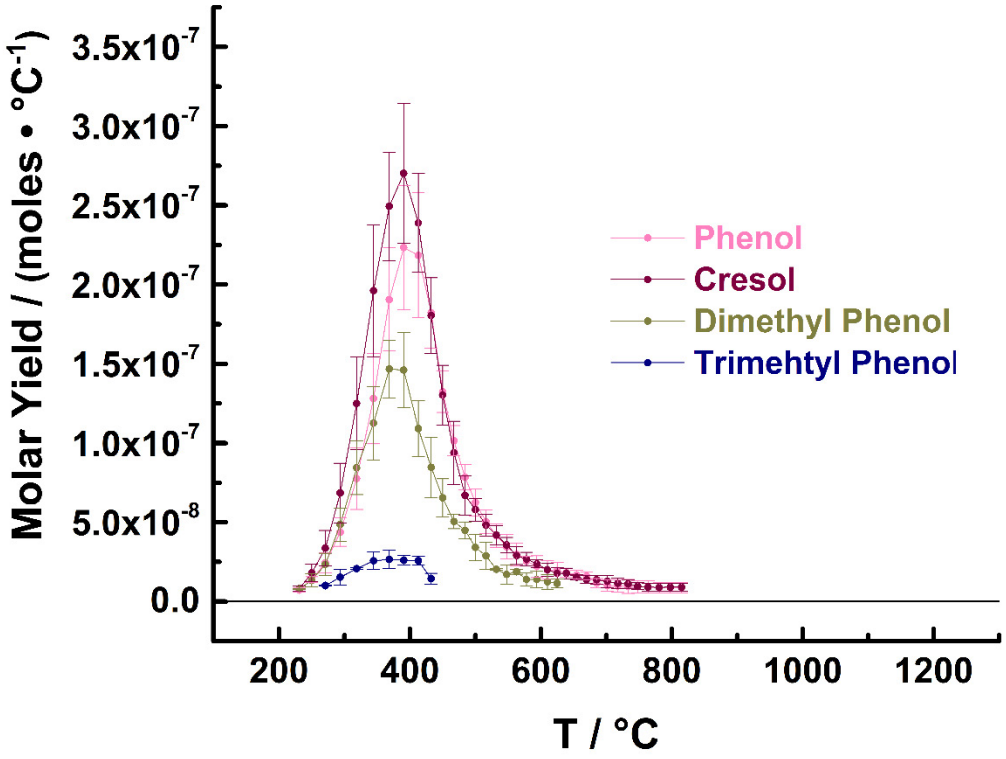

Figure S20. Molar yields of phenol and its derivatives, measured during the pyrolysis of PICA with a nominal heating rate of 6.1 °C s^{-1}.

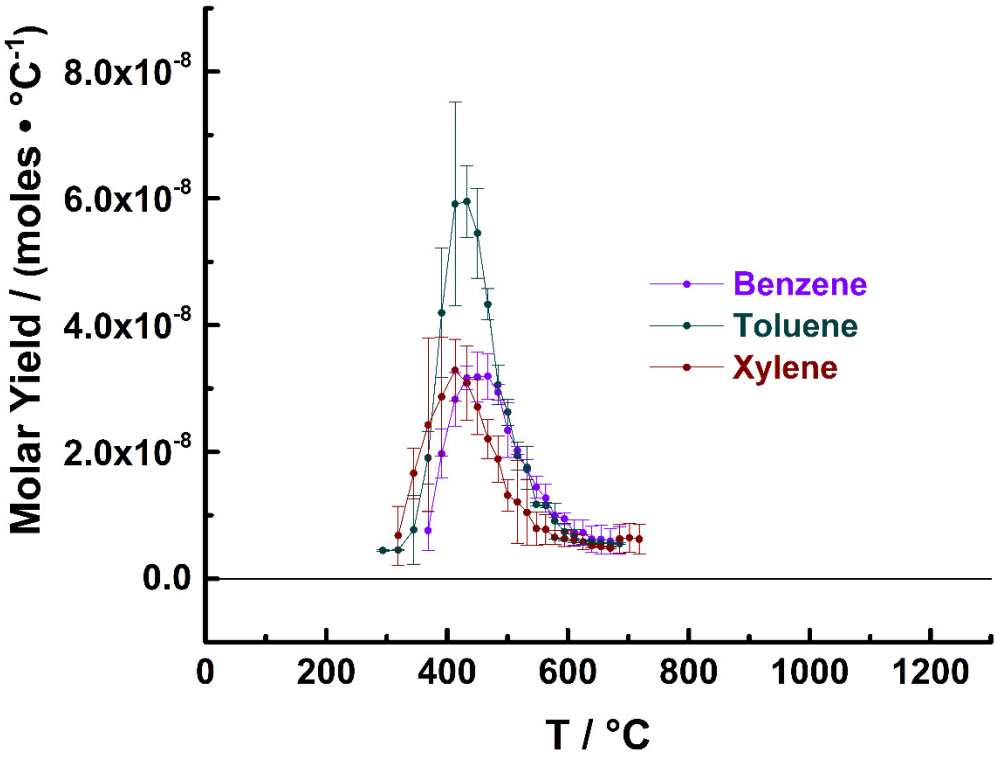

Figure S21. Molar yields of benzene and derivatives, measured during the pyrolysis of PICA with a nominal heating rate of 6.1 °C s^{-1}.

Table S5. Molar yields of pyrolysis products, measured during the pyrolysis of PICA with a nominal heating rate of 6.1 °C s^{-1}.

6.1 °C s^{-1}		H_2		CH_4		CO		CO_2		Phenol		H_2O		1-Propanol	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
91.9	12.4					2.5E-08	5.4E-09	2.6E-08	4.2E-09			1.4E-07	1.4E-08	2.4E-08	6.1E-09
102.3	13.3					2.9E-08	9.4E-09	3.6E-08	3.6E-09			1.8E-07	2.5E-08	2.4E-08	2.0E-09
113.0	14.9					3.7E-08	8.0E-09	4.3E-08	6.9E-09			2.1E-07	2.1E-08	2.7E-08	2.5E-09
125.3	15.6					5.0E-08	7.9E-09	5.0E-08	1.0E-08			2.3E-07	2.7E-08	2.9E-08	2.4E-09
139.0	15.8					5.8E-08	1.0E-08	6.1E-08	7.4E-09			2.5E-07	1.8E-08	3.1E-08	2.6E-09
152.6	14.4					7.8E-08	1.4E-08	6.2E-08	7.1E-09			2.7E-07	1.3E-08	2.9E-08	3.2E-09
166.9	13.0					9.3E-08	1.5E-08	6.2E-08	6.6E-09			3.0E-07	1.6E-08	2.5E-08	2.6E-09
182.5	13.0					1.1E-07	1.6E-08	5.8E-08	8.8E-09			3.3E-07	1.7E-08	2.1E-08	2.1E-09
198.8	12.8					1.2E-07	1.6E-08	5.5E-08	6.8E-09			3.7E-07	2.5E-08	2.0E-08	2.4E-09
214.8	13.9					1.5E-07	2.1E-08	5.6E-08	5.7E-09			4.7E-07	3.5E-08		
231.2	16.1					1.7E-07	2.1E-08	4.9E-08	6.3E-09	7.3E-09	1.2E-09	5.0E-07	6.1E-08		
250.2	18.1					2.1E-07	3.0E-08	5.4E-08	6.0E-09	1.4E-08	1.8E-09	6.8E-07	8.8E-08		
270.9	16.2	6.3E-09	1.3E-09	3.4E-08	5.8E-09	2.6E-07	4.5E-08	6.3E-08	7.3E-09	2.4E-08	6.3E-09	9.1E-07	1.7E-07		
293.7	14.3	1.9E-08	7.0E-09	5.1E-08	1.4E-08	3.5E-07	6.6E-08	8.3E-08	1.6E-08	4.4E-08	8.9E-09	1.2E-06	2.3E-07		
318.9	14.2	4.6E-08	1.8E-08	7.4E-08	2.4E-08	4.7E-07	8.6E-08	9.2E-08	2.3E-08	7.7E-08	1.9E-08	1.6E-06	2.6E-07		
344.6	13.9	1.1E-07	4.3E-08	1.5E-07	4.2E-08	6.8E-07	1.3E-07	1.1E-07	4.2E-09	1.3E-07	2.9E-08	2.0E-06	3.3E-07		
368.6	14.2	2.6E-07	8.9E-08	3.4E-07	9.6E-08	9.4E-07	1.6E-07	1.3E-07	1.8E-08	1.9E-07	3.3E-08	2.3E-06	3.6E-07		
390.9	15.8	5.5E-07	1.7E-07	6.3E-07	1.7E-07	1.3E-06	1.9E-07	1.4E-07	2.1E-08	2.2E-07	3.9E-08	2.6E-06	3.3E-07		
413.0	16.8	1.0E-06	2.7E-07	1.1E-06	1.9E-07	1.7E-06	2.8E-07	1.3E-07	2.3E-08	2.2E-07	3.9E-08	2.7E-06	3.7E-07		
432.7	13.8	1.8E-06	3.4E-07	1.5E-06	2.4E-07	2.1E-06	2.8E-07	1.2E-07	1.9E-08	1.8E-07	2.2E-08	2.7E-06	3.5E-07		
450.1	11.8	2.6E-06	5.1E-07	1.8E-06	2.9E-07	2.3E-06	2.7E-07	1.0E-07	2.1E-08	1.3E-07	1.3E-08	2.4E-06	2.9E-07		
467.4	11.0	3.2E-06	4.6E-07	1.6E-06	1.9E-07	2.3E-06	2.7E-07	8.8E-08	1.4E-08	1.0E-07	9.5E-09	2.1E-06	2.4E-07		
484.3	10.0	3.9E-06	5.7E-07	1.4E-06	1.8E-07	2.1E-06	2.6E-07	6.8E-08	6.3E-09	7.8E-08	8.1E-09	1.8E-06	1.9E-07		
500.2	10.3	4.3E-06	7.0E-07	1.1E-06	1.6E-07	1.9E-06	2.3E-07	5.8E-08	7.0E-09	6.2E-08	8.6E-09	1.5E-06	2.0E-07		
516.4	11.5	4.4E-06	7.2E-07	9.0E-07	1.5E-07	1.6E-06	2.0E-07	5.2E-08	8.7E-09	5.0E-08	7.5E-09	1.3E-06	1.4E-07		
532.3	12.0	4.3E-06	6.8E-07	7.2E-07	1.0E-07	1.3E-06	1.8E-07	4.5E-08	7.9E-09	4.2E-08	7.2E-09	1.1E-06	1.4E-07		
547.9	12.6	4.1E-06	6.7E-07	5.8E-07	7.9E-08	1.1E-06	1.6E-07	4.0E-08	7.6E-09	3.5E-08	7.8E-09	1.0E-06	1.1E-07		
563.2	11.7	3.7E-06	6.8E-07	4.5E-07	8.9E-08	9.1E-07	9.8E-08	3.7E-08	8.0E-09	3.0E-08	7.0E-09	8.6E-07	8.8E-08		
578.1	10.5	3.3E-06	5.2E-07	3.8E-07	6.0E-08	8.2E-07	1.0E-07	3.1E-08	5.1E-09	2.5E-08	3.1E-09	7.3E-07	6.6E-08		
594.2	10.9	3.0E-06	5.0E-07	3.2E-07	4.9E-08	7.1E-07	9.9E-08	2.8E-08	6.1E-09	2.2E-08	6.7E-09	6.5E-07	6.9E-08		
610.2	11.0	2.8E-06	5.3E-07	2.8E-07	5.5E-08	6.4E-07	8.3E-08	2.7E-08	5.2E-09	2.0E-08	5.9E-09	5.8E-07	5.1E-08		
625.1	12.2	2.5E-06	5.0E-07	2.5E-07	4.8E-08	5.8E-07	8.5E-08	2.5E-08	4.0E-09	1.9E-08	5.1E-09	5.3E-07	4.4E-08		
639.4	13.4	2.4E-06	4.6E-07	2.1E-07	4.2E-08	5.4E-07	7.4E-08	2.3E-08	5.8E-09	1.8E-08	2.9E-09	4.8E-07	2.5E-08		
654.7	12.9	2.1E-06	4.4E-07	1.8E-07	3.2E-08	4.8E-07	5.3E-08	2.1E-08	3.5E-09	1.7E-08	2.8E-09	4.3E-07	1.3E-08		

6.1 °C s^{-1}		H_2		CH_4		CO		CO_2		Phenol		H_2O		1-Propanol	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
670.2	11.0	2.0E-06	4.5E-07	1.7E-07	3.7E-08	4.5E-07	6.0E-08	2.0E-08	3.8E-09	1.6E-08	2.7E-09	4.1E-07	2.1E-08		
685.6	8.8	2.0E-06	4.4E-07	1.6E-07	3.5E-08	4.3E-07	6.7E-08	1.9E-08	4.0E-09	1.2E-08	2.9E-09	4.0E-07	2.1E-08		
701.9	7.9	1.9E-06	4.2E-07	1.4E-07	4.4E-08	4.2E-07	7.0E-08	1.9E-08	2.7E-09	1.0E-08	3.6E-09	3.7E-07	2.2E-08		
717.9	6.8	1.8E-06	4.6E-07	1.3E-07	3.9E-08	3.9E-07	6.9E-08	1.8E-08	2.4E-09	9.8E-09	3.8E-09	3.3E-07	2.5E-08		
733.3	7.6	1.8E-06	4.1E-07	1.2E-07	3.4E-08	3.8E-07	5.5E-08	1.8E-08	2.8E-09	9.5E-09	4.4E-09	3.2E-07	1.6E-08		
748.1	9.7	1.7E-06	3.7E-07	1.1E-07	2.8E-08	3.6E-07	5.4E-08	1.8E-08	2.2E-09	9.3E-09	4.0E-09	3.1E-07	4.6E-09		
763.9	11.4	1.7E-06	4.4E-07	1.1E-07	2.9E-08	3.6E-07	5.9E-08	1.7E-08	3.0E-09	9.2E-09	3.9E-09	3.0E-07	1.6E-08		
781.1	11.8	1.7E-06	4.6E-07	1.1E-07	3.0E-08	3.7E-07	6.0E-08	1.7E-08	3.2E-09	8.7E-09	3.2E-09	3.0E-07	2.1E-08		
798.0	10.2	1.7E-06	4.4E-07	1.1E-07	2.7E-08	3.7E-07	5.6E-08	1.7E-08	3.3E-09	8.8E-09	3.2E-09	2.9E-07	1.6E-08		
815.1	8.7	1.7E-06	4.3E-07	1.0E-07	2.8E-08	3.6E-07	5.4E-08	1.6E-08	2.7E-09	8.7E-09	3.2E-09	2.9E-07	1.1E-08		
833.1	8.7	1.8E-06	4.5E-07	1.0E-07	2.5E-08	3.7E-07	5.4E-08	1.7E-08	3.0E-09			2.9E-07	5.1E-09		
851.0	9.2	1.6E-06	3.9E-07	9.3E-08	2.3E-08	3.6E-07	4.5E-08	1.6E-08	1.9E-09			2.7E-07	4.6E-09		
867.4	9.1	1.6E-06	3.4E-07	9.1E-08	1.9E-08	3.5E-07	4.2E-08	1.5E-08	1.2E-09			2.7E-07	7.7E-09		
882.9	11.0	1.5E-06	3.2E-07	8.5E-08	1.5E-08	3.5E-07	4.4E-08	1.5E-08	1.1E-09			2.6E-07	1.4E-08		
899.6	13.5	1.5E-06	3.4E-07	8.5E-08	1.6E-08	3.4E-07	4.2E-08	1.5E-08	1.3E-09			2.4E-07	1.8E-08		
916.1	13.9	1.4E-06	3.3E-07	8.2E-08	1.7E-08	3.4E-07	4.6E-08	1.5E-08	1.3E-09			2.4E-07	2.0E-08		
932.0	14.6	1.4E-06	3.3E-07	7.8E-08	1.4E-08	3.4E-07	4.7E-08	1.5E-08	1.2E-09			2.3E-07	1.5E-08		
948.8	16.3	1.3E-06	3.1E-07	7.8E-08	1.4E-08	3.4E-07	4.7E-08	1.5E-08	1.3E-09			2.2E-07	8.8E-09		
965.4	18.1	1.3E-06	2.9E-07	7.4E-08	1.7E-08	3.3E-07	5.1E-08	1.5E-08	1.3E-09			2.2E-07	6.9E-09		
980.9	18.5	1.3E-06	3.1E-07	7.0E-08	1.3E-08	3.3E-07	5.3E-08	1.3E-08	2.0E-09			2.2E-07	1.1E-09		
995.3	20.4	1.2E-06	3.4E-07	6.6E-08	1.6E-08	3.3E-07	5.2E-08	1.3E-08	2.1E-09			2.1E-07	3.9E-09		
1010.9	23.5	1.2E-06	3.1E-07	6.7E-08	1.6E-08	3.3E-07	5.4E-08	1.3E-08	2.1E-09			2.1E-07	2.7E-09		
1026.3	25.1	1.2E-06	3.2E-07	6.6E-08	1.7E-08	3.3E-07	5.4E-08	1.3E-08	2.1E-09			2.1E-07	2.5E-09		
1041.6	27.0	1.1E-06	3.0E-07	6.4E-08	1.7E-08	3.3E-07	5.6E-08	1.3E-08	2.0E-09			2.1E-07	2.8E-09		
1057.8	28.7	1.1E-06	2.9E-07	6.4E-08	1.8E-08	3.3E-07	5.6E-08	1.3E-08	2.0E-09			2.0E-07	1.1E-08		
1073.7	30.0	1.1E-06	3.2E-07	6.4E-08	1.8E-08	3.3E-07	5.9E-08	1.3E-08	2.1E-09			2.0E-07	9.6E-09		
1088.8	30.1	1.1E-06	3.3E-07	5.9E-08	1.5E-08	3.3E-07	6.4E-08	1.3E-08	1.9E-09			1.9E-07	4.6E-09		
1103.0	31.2	1.0E-06	3.2E-07	5.7E-08	1.8E-08	3.2E-07	6.3E-08	1.3E-08	2.2E-09			1.9E-07	1.6E-09		
1118.2	33.6	1.0E-06	2.8E-07	5.8E-08	1.5E-08	3.2E-07	6.2E-08	1.3E-08	2.0E-09			1.9E-07	7.1E-09		
1133.9	34.8	1.0E-06	2.9E-07	5.8E-08	1.6E-08	3.2E-07	5.8E-08	1.3E-08	2.1E-09			1.8E-07	7.6E-09		
1148.3	35.1	9.9E-07	2.9E-07	5.6E-08	1.7E-08	3.3E-07	5.4E-08	1.3E-08	2.0E-09			1.8E-07	8.7E-09		
1161.7	34.0	9.8E-07	2.8E-07	5.7E-08	1.7E-08	3.3E-07	4.7E-08	1.3E-08	2.1E-09			1.7E-07	1.9E-08		
1174.6	30.7	9.5E-07	2.8E-07	5.7E-08	1.8E-08	3.2E-07	4.8E-08	1.3E-08	2.1E-09			1.7E-07	2.0E-08		
1186.5	27.3	9.1E-07	2.8E-07	5.5E-08	1.7E-08	3.1E-07	4.6E-08	1.3E-08	2.3E-09			1.7E-07	1.9E-08		

6.1 °C s-1		2-Propanol		Xylene		Cresol		Dimethyl Phenol		Trimethyl Phenol		Benzene		Toluene	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
91.9	12.4	1.3E-08	2.3E-09												
102.3	13.3	1.3E-08	4.8E-10												
113.0	14.9	1.3E-08	5.3E-10												
125.3	15.6	1.3E-08	1.1E-09												
139.0	15.8	1.2E-08	5.6E-10												
152.6	14.4	1.2E-08	1.1E-09												
166.9	13.0	9.8E-09	1.2E-09												
182.5	13.0	9.8E-09	1.2E-09												
198.8	12.8	9.5E-09	9.8E-10												
214.8	13.9														
231.2	16.1					8.1E-09	1.7E-09	8.0E-09	2.7E-10						
250.2	18.1					1.8E-08	5.5E-09	1.3E-08	4.1E-09						
270.9	16.2					3.4E-08	1.1E-08	2.3E-08	7.0E-09	1.0E-08	3.7E-10				
293.7	14.3					6.8E-08	1.9E-08	4.9E-08	1.1E-08	1.5E-08	5.1E-09			4.5E-09	7.8E-11
318.9	14.2			6.8E-09	4.6E-09	1.3E-07	2.9E-08	8.4E-08	1.7E-08	2.1E-08	4.1E-10			4.6E-09	9.1E-11
344.6	13.9			1.7E-08	4.0E-09	2.0E-07	4.2E-08	1.1E-07	2.3E-08	2.6E-08	5.5E-09			7.7E-09	5.4E-09
368.6	14.2			2.4E-08	1.4E-08	2.5E-07	3.4E-08	1.5E-07	1.8E-08	2.6E-08	5.8E-09	7.6E-09	3.1E-09	1.9E-08	4.1E-09
390.9	15.8			2.9E-08	9.4E-09	2.7E-07	4.4E-08	1.5E-07	2.4E-08	2.6E-08	2.9E-09	2.0E-08	3.9E-09	4.2E-08	1.0E-08
413.0	16.8			3.3E-08	4.9E-09	2.4E-07	3.1E-08	1.1E-07	1.8E-08	2.6E-08	2.9E-09	2.8E-08	4.2E-09	5.9E-08	1.6E-08
432.7	13.8			3.1E-08	5.9E-09	1.8E-07	2.4E-08	8.5E-08	1.9E-08	1.4E-08	3.4E-09	3.2E-08	1.9E-09	5.9E-08	5.7E-09
450.1	11.8			2.7E-08	4.3E-09	1.3E-07	1.9E-08	6.5E-08	1.2E-08			3.2E-08	4.0E-09	5.5E-08	7.1E-09
467.4	11.0			2.2E-08	3.1E-09	9.4E-08	2.0E-08	5.0E-08	4.5E-09			3.2E-08	3.6E-09	4.3E-08	2.4E-09
484.3	10.0			1.9E-08	3.7E-09	6.7E-08	1.2E-08	4.5E-08	5.3E-09			2.9E-08	1.2E-09	3.1E-08	3.1E-09
500.2	10.3			1.3E-08	2.5E-09	5.8E-08	7.0E-09	3.4E-08	8.5E-09			2.3E-08	4.3E-09	2.6E-08	2.0E-09
516.4	11.5			1.2E-08	6.5E-09	4.8E-08	6.9E-09	2.9E-08	8.6E-09			2.0E-08	6.1E-10	1.9E-08	2.2E-09
532.3	12.0			1.0E-08	5.2E-09	4.2E-08	6.1E-09	2.0E-08	5.2E-10			1.7E-08	1.5E-09	1.8E-08	3.4E-09
547.9	12.6			7.9E-09	2.6E-09	3.6E-08	4.8E-09	1.7E-08	6.2E-09			1.4E-08	1.7E-09	1.2E-08	2.5E-10
563.2	11.7			7.8E-09	2.3E-09	2.9E-08	5.7E-09	1.9E-08	1.6E-09			1.3E-08	2.2E-09	1.2E-08	4.1E-10
578.1	10.5			6.5E-09	1.2E-09	2.7E-08	4.3E-09	1.4E-08	4.0E-09			1.0E-08	2.7E-10	9.1E-09	2.8E-09
594.2	10.9			6.3E-09	1.2E-09	2.4E-08	2.6E-09	1.4E-08	5.2E-09			9.4E-09	9.0E-10	7.4E-09	1.4E-09
610.2	11.0			6.1E-09	9.5E-10	2.0E-08	4.3E-09	1.2E-08	4.5E-09			7.3E-09	2.0E-09	6.8E-09	1.1E-09
625.1	12.2			5.7E-09	1.2E-09	1.8E-08	3.7E-09	1.1E-08	2.8E-09			7.3E-09	2.0E-09	5.8E-09	3.6E-10
639.4	13.4			5.2E-09	2.0E-10	1.8E-08	3.4E-09					6.3E-09	2.0E-09	5.7E-09	2.3E-10
654.7	12.9			5.1E-09	6.2E-11	1.5E-08	1.6E-09					6.2E-09	2.3E-09	5.6E-09	6.9E-11

6.1 °C s^{-1}		2-Propanol		Xylene		Cresol		Dimethyl Phenol		Trimethyl Phenol		Benzene		Toluene	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
670.2	11.0			4.9E-09	1.9E-10	1.4E-08	2.4E-09					5.9E-09	2.0E-09	5.4E-09	2.1E-10
685.6	8.8			6.3E-09	2.2E-09	1.4E-08	2.8E-09					6.1E-09	2.1E-09	5.5E-09	1.0E-10
701.9	7.9			6.5E-09	2.2E-09	1.3E-08	3.9E-09								
717.9	6.8			6.2E-09	2.3E-09	1.1E-08	3.2E-09								
733.3	7.6					1.1E-08	2.7E-09								
748.1	9.7					9.6E-09	2.2E-09								
763.9	11.4					9.0E-09	2.6E-09								
781.1	11.8					9.0E-09	2.6E-09								
798.0	10.2					9.1E-09	2.6E-09								
815.1	8.7					9.0E-09	2.7E-09								
833.1	8.7														
851.0	9.2														
867.4	9.1														
882.9	11.0														
899.6	13.5														
916.1	13.9														
932.0	14.6														
948.8	16.3														
965.4	18.1														
980.9	18.5														
995.3	20.4														
1010.9	23.5														
1026.3	25.1														
1041.6	27.0														
1057.8	28.7														
1073.7	30.0														
1088.8	30.1														
1103.0	31.2														
1118.2	33.6														
1133.9	34.8														
1148.3	35.1														
1161.7	34.0														
1174.6	30.7														
1186.5	27.3														

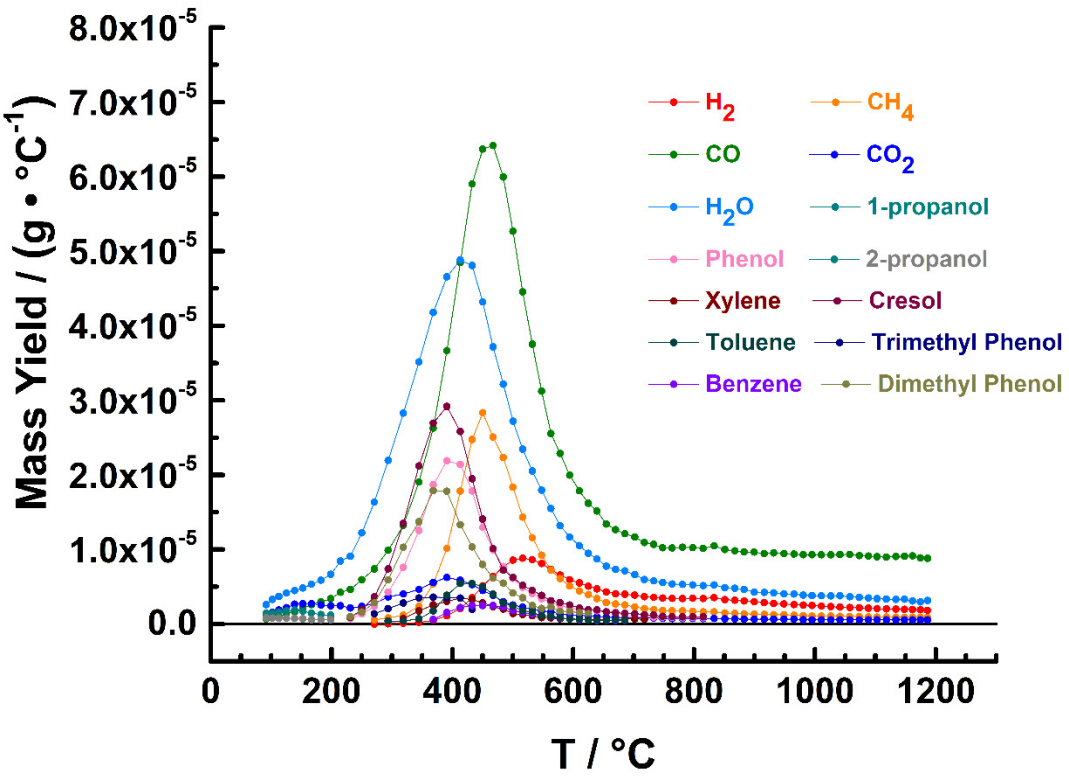

Figure S22. Mass yields of pyrolysis products as a function of nominal heating rate of PICA, measured during the pyrolysis of PICA with a nominal heating rate of 6.1 °C s^{-1}.

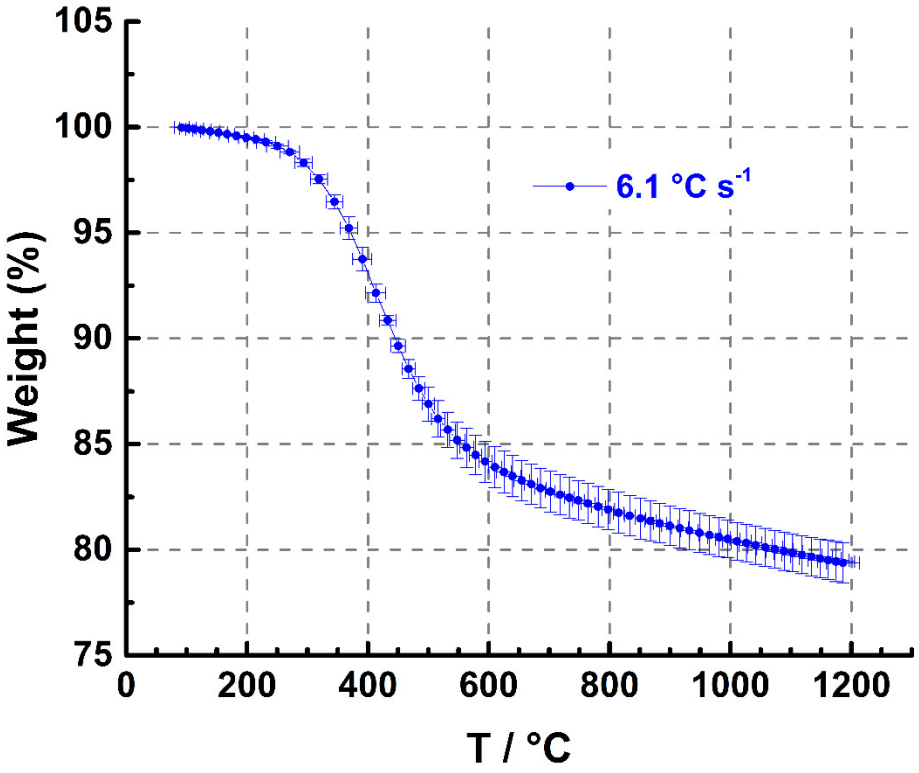

Figure S23. Simulated thermogravimetric analysis (TGA) curve of PICA, with at a nominal heating rate of 6.1 °C s^{-1}.

Table S6. TGA data collected with a nominal heating rate of 6.1 °C s^{-1}.

T / °C	± °C	% Weight	± % Weight
91.9	12.4	100.0	0.0
102.3	13.3	99.9	0.0
113.0	14.9	99.9	0.0
125.3	15.6	99.9	0.0
139.0	15.8	99.8	0.0
152.6	14.4	99.7	0.0
166.9	13.0	99.7	0.0
182.5	13.0	99.6	0.0
198.8	12.8	99.5	0.0
214.8	13.9	99.4	0.0
231.2	16.1	99.3	0.1
250.2	18.1	99.1	0.1
270.9	16.2	98.8	0.1
293.7	14.3	98.3	0.2
318.9	14.2	97.5	0.2
344.6	13.9	96.5	0.3
368.6	14.2	95.2	0.5
390.9	15.8	93.8	0.6
413.0	16.8	92.1	0.4
432.7	13.8	90.9	0.2
450.1	11.8	89.6	0.3
467.4	11.0	88.6	0.4
484.3	10.0	87.6	0.5
500.2	10.3	86.9	0.8
516.4	11.5	86.2	0.9
532.3	12.0	85.7	0.8
547.9	12.6	85.2	0.9
563.2	11.7	84.8	0.9
578.1	10.5	84.5	0.9
594.2	10.9	84.2	1.0
610.2	11.0	83.9	1.0
625.1	12.2	83.7	1.0
639.4	13.4	83.5	1.0
654.7	12.9	83.3	1.0
	SD (1σ)		SD (1σ)

T / °C	± °C	% Weight	± % Weight
670.2	11.0	83.1	1.0
685.6	8.8	82.9	1.0
701.9	7.9	82.8	1.0
717.9	6.8	82.6	1.0
733.3	7.6	82.5	1.0
748.1	9.7	82.3	0.9
763.9	11.4	82.2	0.9
781.1	11.8	82.0	1.0
798.0	10.2	81.9	1.0
815.1	8.7	81.8	1.0
833.1	8.7	81.6	1.0
851.0	9.2	81.5	1.0
867.4	9.1	81.4	1.0
882.9	11.0	81.3	0.9
899.6	13.5	81.1	0.9
916.1	13.9	81.0	0.9
932.0	14.6	80.9	0.9
948.8	16.3	80.8	0.9
965.4	18.1	80.7	0.9
980.9	18.5	80.6	0.9
995.3	20.4	80.5	0.9
1010.9	23.5	80.4	0.9
1026.3	25.1	80.3	0.9
1041.6	27.0	80.2	0.9
1057.8	28.7	80.1	0.9
1073.7	30.0	80.0	0.9
1088.8	30.1	79.9	0.9
1103.0	31.2	79.8	0.9
1118.2	33.6	79.8	0.9
1133.9	34.8	79.7	0.9
1148.3	35.1	79.6	0.9
1161.7	34.0	79.5	0.9
1174.6	30.7	79.4	0.9
1186.5	27.3	79.4	1.0
	SD (1σ)		SD (1σ)

D. 3.1 °C s^{-1}

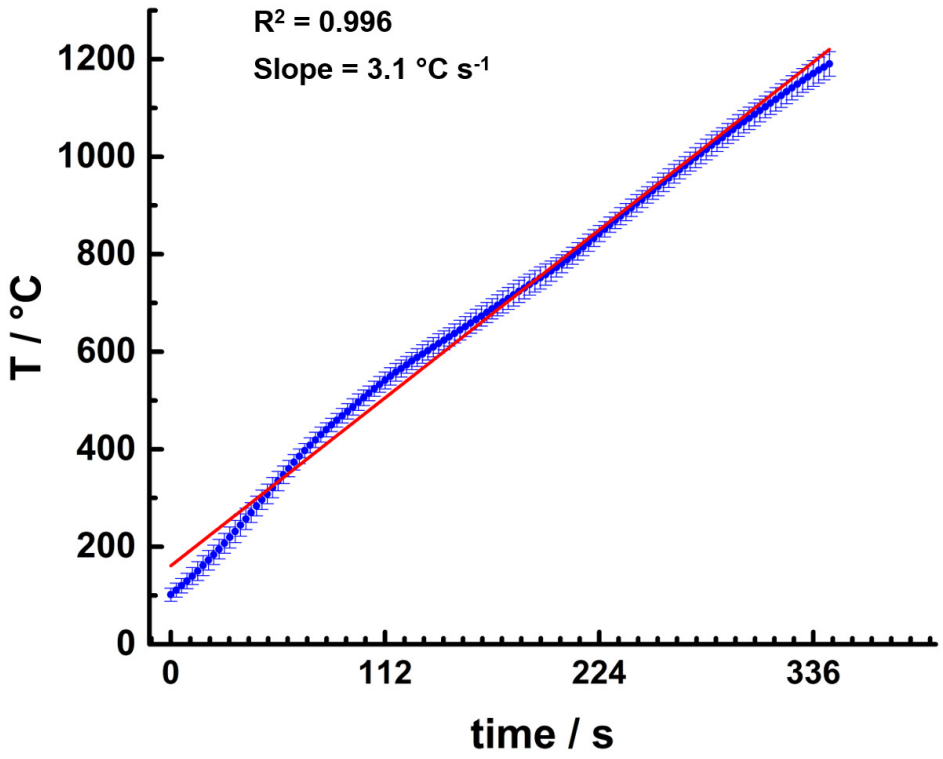

Figure S24. Heating profile for PICA, with a nominal heating rate of 3.1 °C s^{-1}.

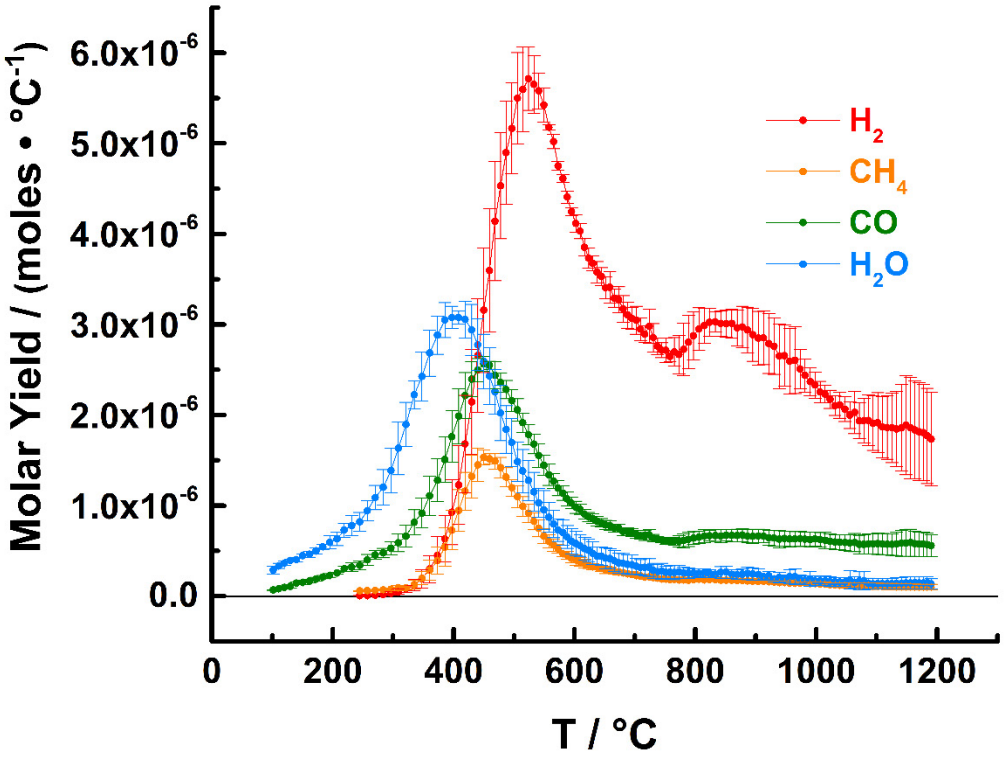

Figure S25. Molar yields of hydrogen, methane, carbon monoxide, and water, measured during the pyrolysis of PICA with a nominal heating rate of 3.1 °C s^{-1}.

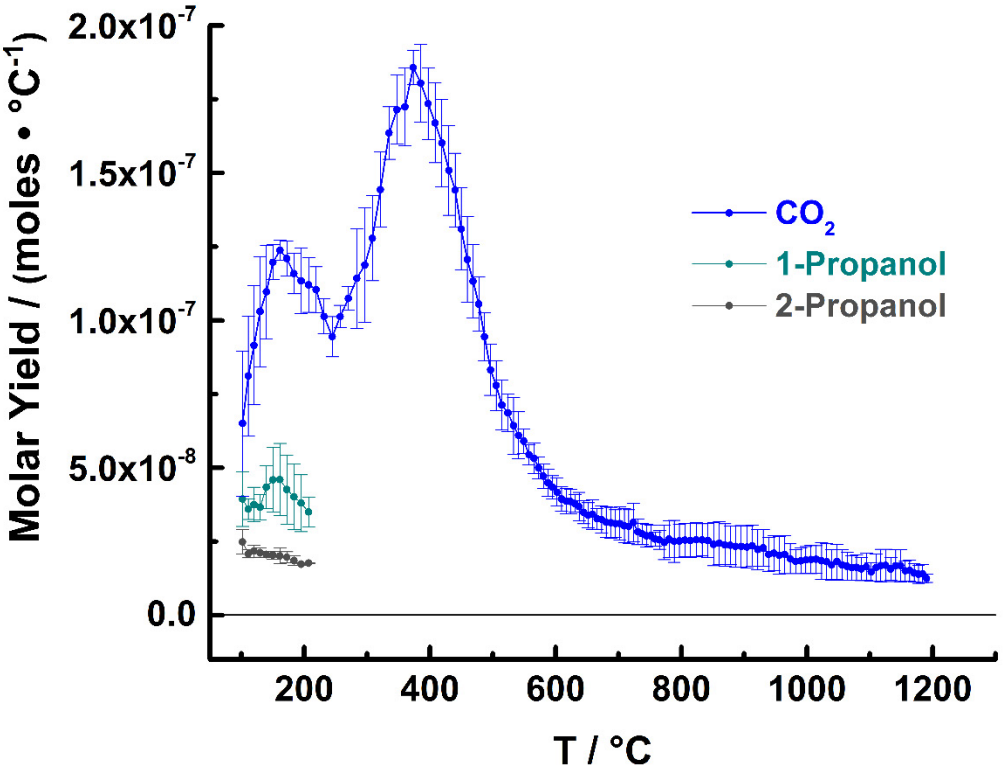

Figure S26. Molar yields of carbon dioxide, 1-propanol, and 2-propanol, measured during the pyrolysis of PICA with a nominal heating rate of 3.1 °C s^{-1}.

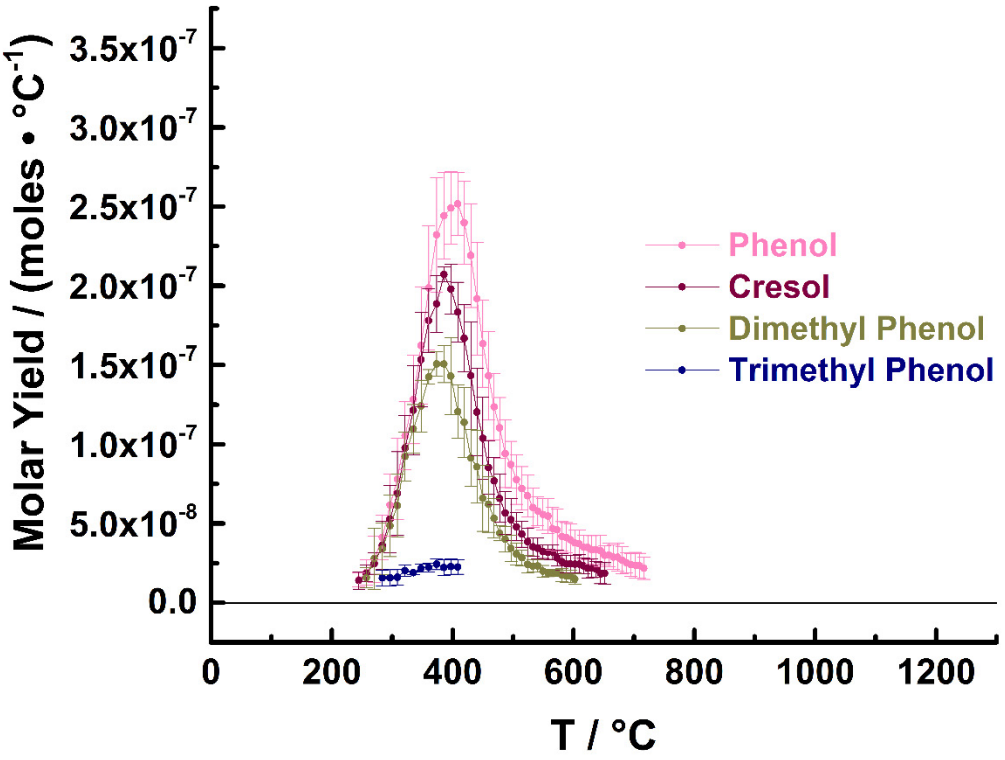

Figure S27. Molar yields of phenol and its derivatives, measured during the pyrolysis of PICA with a nominal heating rate of 3.1 °C s^{-1}.

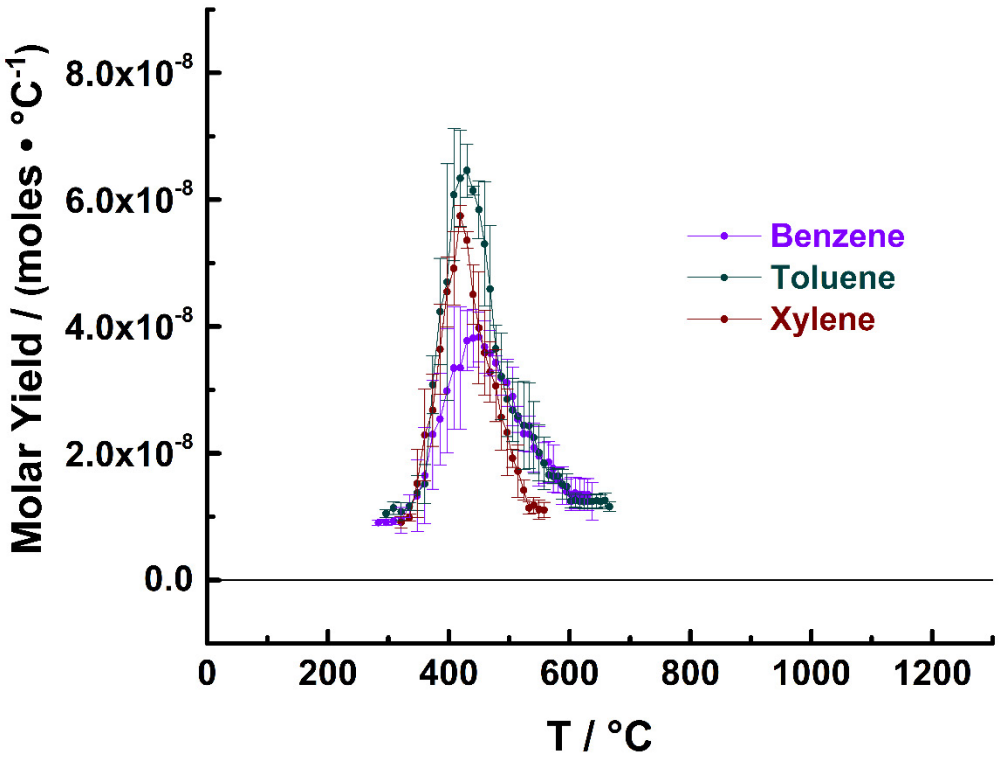

Figure S28. Molar yields of benzene and its derivatives, measured during the pyrolysis of PICA with a nominal heating rate of 3.1 °C s^{-1}.

Table S7. Molar yields of pyrolysis products, measured during the pyrolysis of PICA with a nominal heating rate of 3.1 °C s^{-1}.

3.1 °C s^{-1}		H_2		CH_4		CO		CO_2		Phenol		H_2O		1-Propanol	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
101.8	13.4					6.8E-08	3.7E-09	6.5E-08	2.5E-08			2.9E-07	4.3E-08	3.9E-08	9.3E-09
111.0	14.4					8.2E-08	1.3E-08	8.1E-08	2.0E-08			3.3E-07	2.9E-08	3.6E-08	3.5E-09
120.2	15.0					9.5E-08	1.6E-08	9.2E-08	2.0E-08			3.6E-07	2.4E-08	3.8E-08	5.9E-09
129.8	15.7					1.1E-07	2.0E-08	1.0E-07	1.9E-08			3.9E-07	1.8E-08	3.7E-08	4.4E-09
139.9	17.5					1.4E-07	1.6E-08	1.1E-07	1.6E-08			4.0E-07	2.3E-08	4.3E-08	7.3E-09
150.2	19.3					1.5E-07	2.2E-08	1.2E-07	5.9E-09			4.5E-07	1.7E-08	4.6E-08	1.1E-08
161.4	20.4					1.7E-07	2.3E-08	1.2E-07	3.5E-09			4.6E-07	3.2E-08	4.6E-08	1.2E-08
172.4	20.2					1.9E-07	2.2E-08	1.2E-07	6.0E-09			5.0E-07	3.4E-08	4.3E-08	1.2E-08
183.6	19.8					2.1E-07	1.9E-08	1.2E-07	6.9E-09			5.4E-07	2.6E-08	4.0E-08	1.1E-08
195.1	19.9					2.3E-07	2.0E-08	1.1E-07	1.1E-08			5.9E-07	7.2E-08	3.8E-08	9.6E-09
207.0	20.2					2.5E-07	1.2E-08	1.1E-07	9.3E-09			6.3E-07	7.3E-08	3.5E-08	5.0E-09
219.1	21.6					3.0E-07	3.2E-08	1.1E-07	7.8E-09			7.3E-07	7.7E-08		
231.5	22.8					3.2E-07	4.8E-08	1.0E-07	6.0E-09			7.8E-07	1.1E-07		
244.7	22.8	7.1E-09	4.5E-10	5.8E-08	5.2E-09	3.4E-07	5.0E-08	9.4E-08	6.8E-09	1.4E-08	4.4E-09	8.2E-07	1.0E-07		
257.3	21.7	7.2E-09	2.8E-10	6.0E-08	7.4E-09	4.0E-07	5.9E-08	1.0E-07	3.8E-09	1.9E-08	7.8E-09	9.4E-07	1.1E-07		
270.2	20.5	1.2E-08	4.9E-09	6.3E-08	6.0E-09	4.5E-07	4.8E-08	1.1E-07	4.0E-09	2.8E-08	1.5E-08	1.1E-06	1.3E-07		
283.8	20.2	1.8E-08	1.2E-08	6.8E-08	8.3E-09	4.8E-07	5.2E-08	1.1E-07	1.7E-08	4.1E-08	1.4E-08	1.2E-06	2.0E-07		
296.4	19.9	3.1E-08	1.8E-08	7.7E-08	1.3E-08	5.3E-07	7.0E-08	1.2E-07	1.9E-08	6.2E-08	2.0E-08	1.4E-06	2.4E-07		
308.4	20.1	4.8E-08	2.9E-08	9.2E-08	2.9E-08	5.9E-07	9.8E-08	1.3E-07	1.4E-08	7.8E-08	2.6E-08	1.6E-06	2.9E-07		
321.3	20.6	8.1E-08	3.8E-08	9.0E-08	1.7E-08	6.6E-07	1.2E-07	1.4E-07	1.3E-08	1.1E-07	2.1E-08	1.9E-06	2.4E-07		
334.9	19.8	1.2E-07	6.4E-08	1.3E-07	4.8E-08	8.2E-07	1.4E-07	1.6E-07	8.9E-09	1.3E-07	2.8E-08	2.2E-06	1.5E-07		
347.7	18.2	1.9E-07	1.0E-07	2.0E-07	7.4E-08	9.2E-07	1.7E-07	1.7E-07	1.2E-08	1.6E-07	3.7E-08	2.4E-06	2.7E-07		
360.3	16.6	3.0E-07	1.5E-07	2.9E-07	1.1E-07	1.1E-06	2.2E-07	1.7E-07	1.3E-08	2.0E-07	3.9E-08	2.7E-06	2.6E-07		
373.4	16.0	4.5E-07	2.1E-07	3.9E-07	1.5E-07	1.3E-06	2.4E-07	1.9E-07	5.9E-09	2.3E-07	3.6E-08	2.9E-06	2.1E-07		
385.5	15.1	6.3E-07	2.6E-07	5.4E-07	2.1E-07	1.5E-06	2.5E-07	1.8E-07	1.3E-08	2.4E-07	2.7E-08	3.0E-06	1.9E-07		
397.1	14.5	9.3E-07	3.6E-07	7.3E-07	2.2E-07	1.8E-06	2.8E-07	1.7E-07	1.2E-08	2.5E-07	2.3E-08	3.1E-06	1.2E-07		
408.3	15.4	1.2E-06	4.3E-07	9.5E-07	2.3E-07	2.0E-06	3.0E-07	1.7E-07	1.4E-08	2.5E-07	2.0E-08	3.1E-06	7.2E-08		
419.0	15.7	1.7E-06	5.4E-07	1.2E-06	2.1E-07	2.2E-06	2.5E-07	1.6E-07	1.5E-08	2.4E-07	2.6E-08	3.1E-06	2.0E-07		
430.1	15.3	2.1E-06	5.8E-07	1.3E-06	2.4E-07	2.4E-06	1.9E-07	1.5E-07	1.5E-08	2.2E-07	3.3E-08	2.9E-06	2.8E-07		
440.1	14.3	2.7E-06	6.3E-07	1.5E-06	1.8E-07	2.5E-06	1.3E-07	1.4E-07	1.2E-08	1.9E-07	3.6E-08	2.8E-06	2.8E-07		
449.9	13.5	3.2E-06	6.9E-07	1.5E-06	8.3E-08	2.6E-06	7.9E-08	1.3E-07	1.4E-08	1.6E-07	2.7E-08	2.6E-06	3.0E-07		
459.5	14.0	3.6E-06	6.8E-07	1.5E-06	5.4E-08	2.6E-06	4.4E-08	1.2E-07	1.5E-08	1.4E-07	2.8E-08	2.4E-06	3.1E-07		
468.7	14.9	4.1E-06	6.6E-07	1.5E-06	8.6E-08	2.4E-06	1.5E-07	1.1E-07	1.3E-08	1.2E-07	2.1E-08	2.3E-06	2.5E-07		
477.7	15.8	4.5E-06	5.8E-07	1.4E-06	1.1E-07	2.4E-06	1.1E-07	1.1E-07	9.1E-09	1.1E-07	1.9E-08	2.0E-06	3.1E-07		

3.1 °C s^{-1}		H_2		CH_4		CO		CO_2		Phenol		H_2O		1-Propanol	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
486.8	16.6	4.9E-06	5.7E-07	1.3E-06	1.0E-07	2.3E-06	1.0E-07	9.4E-08	8.1E-09	9.4E-08	2.1E-08	1.8E-06	2.6E-07		
496.5	16.9	5.2E-06	5.0E-07	1.2E-06	9.0E-08	2.2E-06	1.2E-07	8.3E-08	8.6E-09	8.7E-08	1.5E-08	1.7E-06	2.7E-07		
505.5	16.0	5.5E-06	5.0E-07	1.1E-06	1.2E-07	2.1E-06	1.2E-07	7.8E-08	8.5E-09	7.8E-08	1.6E-08	1.5E-06	2.1E-07		
514.6	15.2	5.6E-06	4.7E-07	9.9E-07	1.1E-07	1.9E-06	1.1E-07	7.1E-08	8.4E-09	7.2E-08	1.4E-08	1.4E-06	2.4E-07		
524.2	15.3	5.7E-06	3.5E-07	9.2E-07	1.0E-07	1.8E-06	1.1E-07	6.9E-08	6.4E-09	6.7E-08	1.3E-08	1.3E-06	2.2E-07		
533.0	16.2	5.7E-06	3.2E-07	8.3E-07	9.6E-08	1.7E-06	1.1E-07	6.4E-08	9.6E-09	6.0E-08	1.2E-08	1.2E-06	2.2E-07		
541.1	17.3	5.6E-06	2.0E-07	7.5E-07	9.4E-08	1.6E-06	1.3E-07	6.1E-08	8.0E-09	5.8E-08	9.1E-09	1.0E-06	1.6E-07		
549.4	17.8	5.4E-06	1.9E-07	6.6E-07	8.0E-08	1.4E-06	1.1E-07	5.9E-08	4.2E-09	5.6E-08	9.9E-09	9.5E-07	2.1E-07		
557.9	18.1	5.2E-06	2.7E-08	6.0E-07	7.4E-08	1.3E-06	1.2E-07	5.4E-08	3.4E-09	5.5E-08	1.1E-08	8.7E-07	1.6E-07		
565.5	17.5	5.0E-06	8.0E-08	5.6E-07	7.0E-08	1.3E-06	8.2E-08	5.3E-08	5.2E-09	4.7E-08	1.3E-08	7.9E-07	1.5E-07		
573.0	17.2	4.8E-06	5.1E-08	5.2E-07	4.7E-08	1.2E-06	8.4E-08	5.0E-08	3.7E-09	4.6E-08	1.3E-08	7.3E-07	1.2E-07		
580.8	17.5	4.6E-06	4.0E-08	4.7E-07	3.2E-08	1.1E-06	7.9E-08	4.7E-08	4.2E-09	4.2E-08	9.4E-09	7.0E-07	1.4E-07		
588.1	18.2	4.4E-06	6.8E-08	4.5E-07	4.5E-08	1.1E-06	7.5E-08	4.5E-08	4.6E-09	4.1E-08	9.5E-09	6.5E-07	1.3E-07		
595.3	18.9	4.2E-06	4.6E-08	4.2E-07	5.0E-08	1.0E-06	6.4E-08	4.3E-08	3.9E-09	4.0E-08	9.9E-09	6.0E-07	1.4E-07		
602.3	19.3	4.1E-06	9.6E-08	4.0E-07	5.5E-08	9.8E-07	6.8E-08	4.2E-08	4.8E-09	3.8E-08	8.1E-09	5.8E-07	1.3E-07		
609.4	19.7	4.0E-06	8.4E-08	3.8E-07	4.9E-08	9.6E-07	5.5E-08	3.9E-08	4.1E-09	3.7E-08	9.0E-09	5.6E-07	1.2E-07		
616.8	19.9	3.9E-06	9.7E-08	3.6E-07	4.8E-08	9.1E-07	5.2E-08	3.9E-08	4.2E-09	3.5E-08	7.6E-09	5.2E-07	1.3E-07		
623.6	19.5	3.7E-06	1.1E-07	3.4E-07	3.6E-08	8.7E-07	4.9E-08	3.9E-08	4.2E-09	3.5E-08	7.6E-09	5.1E-07	1.3E-07		
630.4	18.9	3.7E-06	8.2E-08	3.3E-07	3.4E-08	8.6E-07	5.1E-08	3.8E-08	3.0E-09	3.3E-08	9.0E-09	4.7E-07	1.2E-07		
637.4	19.5	3.6E-06	1.2E-07	3.2E-07	3.2E-08	8.3E-07	5.5E-08	3.7E-08	4.8E-09	3.4E-08	9.3E-09	4.4E-07	9.7E-08		
644.5	20.2	3.5E-06	9.8E-08	3.1E-07	3.6E-08	8.1E-07	4.7E-08	3.5E-08	3.9E-09	3.3E-08	9.9E-09	4.4E-07	9.9E-08		
651.6	20.4	3.4E-06	1.2E-07	2.9E-07	4.2E-08	7.9E-07	5.1E-08	3.4E-08	4.2E-09	3.0E-08	6.1E-09	4.2E-07	1.1E-07		
658.7	20.8	3.4E-06	1.7E-07	2.9E-07	3.6E-08	7.8E-07	5.2E-08	3.4E-08	5.0E-09	3.0E-08	7.5E-09	4.1E-07	1.1E-07		
666.1	21.1	3.3E-06	9.9E-08	2.7E-07	2.6E-08	7.5E-07	4.3E-08	3.3E-08	3.5E-09	2.9E-08	7.6E-09	3.9E-07	1.1E-07		
673.2	20.7	3.3E-06	1.4E-07	2.6E-07	2.8E-08	7.5E-07	4.4E-08	3.2E-08	4.6E-09	2.9E-08	8.7E-09	3.7E-07	1.1E-07		
680.5	20.5	3.2E-06	1.5E-07	2.6E-07	2.5E-08	7.1E-07	4.4E-08	3.2E-08	5.2E-09	2.7E-08	8.6E-09	3.6E-07	1.1E-07		
688.1	20.9	3.1E-06	1.4E-07	2.5E-07	2.5E-08	7.1E-07	4.6E-08	3.1E-08	5.2E-09	2.5E-08	6.4E-09	3.5E-07	1.1E-07		
695.2	21.6	3.1E-06	1.2E-07	2.4E-07	2.7E-08	7.0E-07	4.2E-08	3.1E-08	4.7E-09	2.4E-08	7.2E-09	3.5E-07	1.1E-07		
702.3	22.4	3.0E-06	1.5E-07	2.3E-07	2.2E-08	6.8E-07	4.1E-08	3.1E-08	5.6E-09	2.4E-08	8.2E-09	3.3E-07	8.8E-08		
709.4	22.6	2.9E-06	1.2E-07	2.2E-07	1.8E-08	6.7E-07	3.7E-08	3.0E-08	5.8E-09	2.3E-08	7.9E-09	3.2E-07	8.5E-08		
716.4	22.8	2.9E-06	9.1E-08	2.1E-07	2.4E-08	6.7E-07	5.5E-08	3.0E-08	5.7E-09	2.2E-08	7.0E-09	3.2E-07	9.7E-08		
723.8	22.8	3.0E-06	1.9E-07	2.1E-07	2.9E-08	6.8E-07	5.9E-08	3.1E-08	6.6E-09			3.2E-07	9.7E-08		
730.7	22.2	2.9E-06	1.5E-07	2.0E-07	2.2E-08	6.4E-07	4.0E-08	2.8E-08	4.4E-09			2.8E-07	8.2E-08		
737.7	21.6	2.8E-06	9.1E-08	2.0E-07	2.1E-08	6.3E-07	2.6E-08	2.8E-08	3.6E-09			2.7E-07	7.8E-08		

3.1 °C s^{-1}		H_2		CH_4		CO		CO_2		Phenol		H_2O		1-Propanol	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
744.6	22.1	2.7E-06	8.1E-08	1.9E-07	2.2E-08	6.2E-07	2.8E-08	2.7E-08	3.9E-09			2.8E-07	8.9E-08		
751.4	22.6	2.7E-06	1.3E-07	1.9E-07	1.6E-08	6.1E-07	3.5E-08	2.7E-08	3.6E-09			2.6E-07	7.2E-08		
758.3	21.8	2.6E-06	6.1E-08	1.8E-07	2.4E-08	6.1E-07	2.9E-08	2.6E-08	2.4E-09			2.6E-07	7.3E-08		
765.3	20.9	2.7E-06	1.6E-07	1.8E-07	2.3E-08	6.1E-07	4.6E-08	2.6E-08	3.2E-09			2.6E-07	7.9E-08		
773.0	19.8	2.7E-06	2.1E-07	1.8E-07	2.1E-08	6.1E-07	6.4E-08	2.5E-08	5.8E-09			2.7E-07	7.0E-08		
780.6	18.3	2.7E-06	2.9E-07	1.8E-07	2.5E-08	6.1E-07	7.7E-08	2.6E-08	6.3E-09			2.6E-07	6.5E-08		
788.7	17.0	2.8E-06	2.9E-07	1.8E-07	1.4E-08	6.3E-07	7.8E-08	2.5E-08	7.1E-09			2.6E-07	5.9E-08		
797.0	17.5	2.9E-06	2.7E-07	1.8E-07	1.6E-08	6.4E-07	7.1E-08	2.5E-08	5.6E-09			2.5E-07	4.8E-08		
805.8	18.0	3.0E-06	2.3E-07	1.9E-07	1.4E-08	6.5E-07	6.9E-08	2.5E-08	5.7E-09			2.5E-07	3.5E-08		
814.8	17.7	3.0E-06	1.9E-07	1.8E-07	9.4E-09	6.6E-07	6.9E-08	2.5E-08	5.8E-09			2.5E-07	4.9E-08		
823.7	17.6	3.0E-06	1.5E-07	1.8E-07	1.0E-08	6.7E-07	5.9E-08	2.6E-08	5.7E-09			2.5E-07	4.3E-08		
833.3	17.4	3.0E-06	1.1E-07	1.8E-07	8.5E-09	6.7E-07	6.4E-08	2.6E-08	5.5E-09			2.4E-07	2.8E-08		
842.4	16.6	3.0E-06	1.4E-07	1.7E-07	6.4E-09	6.6E-07	7.0E-08	2.5E-08	5.8E-09			2.6E-07	6.4E-08		
851.3	15.8	3.0E-06	1.5E-07	1.8E-07	5.0E-09	6.7E-07	6.3E-08	2.4E-08	7.3E-09			2.6E-07	6.8E-08		
860.6	15.8	3.0E-06	1.6E-07	1.8E-07	9.6E-09	6.7E-07	6.7E-08	2.4E-08	7.2E-09			2.4E-07	4.7E-08		
869.4	16.6	3.0E-06	2.0E-07	1.7E-07	8.0E-09	6.7E-07	6.9E-08	2.4E-08	7.2E-09			2.4E-07	5.3E-08		
878.0	17.6	3.0E-06	2.3E-07	1.7E-07	6.5E-09	6.7E-07	7.2E-08	2.4E-08	6.6E-09			2.4E-07	5.8E-08		
886.6	17.7	2.9E-06	2.5E-07	1.7E-07	9.2E-09	6.6E-07	7.6E-08	2.3E-08	7.0E-09			2.5E-07	7.0E-08		
895.2	17.8	2.9E-06	2.9E-07	1.7E-07	1.0E-08	6.6E-07	7.8E-08	2.3E-08	7.1E-09			2.4E-07	6.7E-08		
904.4	17.9	2.8E-06	3.0E-07	1.6E-07	1.0E-08	6.6E-07	7.6E-08	2.3E-08	7.2E-09			2.4E-07	6.0E-08		
913.0	17.2	2.9E-06	3.0E-07	1.6E-07	8.7E-09	6.6E-07	7.6E-08	2.3E-08	7.0E-09			2.1E-07	3.3E-08		
921.7	16.7	2.8E-06	3.3E-07	1.6E-07	1.3E-08	6.5E-07	8.1E-08	2.2E-08	6.8E-09			2.3E-07	5.0E-08		
930.4	17.6	2.8E-06	3.1E-07	1.6E-07	1.1E-08	6.4E-07	8.6E-08	2.3E-08	6.2E-09			1.9E-07	3.2E-08		
938.9	18.8	2.7E-06	3.6E-07	1.5E-07	1.1E-08	6.3E-07	9.3E-08	2.1E-08	5.7E-09			2.1E-07	5.8E-08		
947.5	18.9	2.7E-06	3.4E-07	1.5E-07	1.2E-08	6.4E-07	8.2E-08	2.1E-08	5.9E-09			2.0E-07	4.0E-08		
956.1	19.0	2.6E-06	3.6E-07	1.4E-07	1.6E-08	6.3E-07	8.9E-08	2.0E-08	6.3E-09			2.1E-07	7.5E-08		
965.0	19.3	2.6E-06	3.7E-07	1.4E-07	1.4E-08	6.3E-07	8.3E-08	2.1E-08	6.5E-09			2.1E-07	8.5E-08		
973.4	18.7	2.5E-06	2.2E-07	1.5E-07	1.4E-08	6.4E-07	8.1E-08	1.9E-08	5.1E-09			1.9E-07	4.4E-08		
981.8	18.3	2.4E-06	1.8E-07	1.4E-07	1.4E-08	6.3E-07	8.0E-08	1.8E-08	4.1E-09			1.8E-07	4.9E-08		
990.1	19.3	2.4E-06	1.5E-07	1.4E-07	1.7E-08	6.3E-07	8.0E-08	1.8E-08	4.3E-09			1.9E-07	8.2E-08		
998.2	20.5	2.3E-06	1.5E-07	1.4E-07	1.8E-08	6.3E-07	7.7E-08	1.9E-08	4.5E-09			1.7E-07	5.4E-08		
1006.5	20.7	2.3E-06	1.2E-07	1.3E-07	2.2E-08	6.2E-07	7.8E-08	1.9E-08	4.8E-09			1.7E-07	5.3E-08		
1014.7	21.0	2.2E-06	9.7E-08	1.3E-07	2.1E-08	6.2E-07	9.0E-08	1.9E-08	4.6E-09			1.7E-07	5.3E-08		
1023.3	21.3	2.2E-06	1.0E-07	1.3E-07	2.3E-08	6.1E-07	8.3E-08	1.8E-08	6.2E-09			1.6E-07	5.2E-08		

3.1 °C s^{-1}		H_2		CH_4		CO		CO_2		Phenol		H_2O		1-Propanol	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
1031.2	20.7	2.1E-06	1.1E-07	1.2E-07	2.3E-08	6.0E-07	8.2E-08	1.8E-08	6.1E-09			1.6E-07	5.1E-08		
1039.1	20.3	2.1E-06	1.4E-07	1.2E-07	2.4E-08	5.9E-07	8.1E-08	1.7E-08	5.1E-09			1.6E-07	5.0E-08		
1047.8	20.5	2.1E-06	1.4E-07	1.2E-07	2.8E-08	5.9E-07	8.5E-08	1.8E-08	6.0E-09			1.6E-07	5.1E-08		
1055.9	21.5	2.0E-06	1.5E-07	1.2E-07	3.0E-08	5.9E-07	9.4E-08	1.7E-08	5.2E-09			1.8E-07	1.0E-07		
1063.8	22.5	2.0E-06	2.3E-07	1.2E-07	2.9E-08	5.9E-07	1.0E-07	1.7E-08	4.7E-09			1.5E-07	6.2E-08		
1071.4	22.8	1.9E-06	2.0E-07	1.1E-07	3.0E-08	5.7E-07	1.0E-07	1.6E-08	4.1E-09			1.7E-07	9.9E-08		
1078.8	23.1	1.9E-06	2.5E-07	1.1E-07	3.2E-08	5.7E-07	1.1E-07	1.6E-08	4.3E-09			1.7E-07	1.0E-07		
1086.6	23.4	1.9E-06	2.8E-07	1.1E-07	3.6E-08	5.8E-07	1.1E-07	1.6E-08	3.9E-09			1.4E-07	6.0E-08		
1094.4	23.0	1.9E-06	3.0E-07	1.1E-07	3.5E-08	5.8E-07	1.1E-07	1.6E-08	4.6E-09			1.4E-07	5.6E-08		
1102.1	22.4	1.9E-06	3.3E-07	1.1E-07	3.4E-08	5.8E-07	1.2E-07	1.5E-08	3.1E-09			1.4E-07	5.7E-08		
1109.8	23.3	1.9E-06	3.4E-07	1.1E-07	3.3E-08	5.8E-07	1.2E-07	1.6E-08	4.5E-09			1.4E-07	5.7E-08		
1117.6	24.1	1.9E-06	3.5E-07	1.1E-07	3.5E-08	5.7E-07	1.2E-07	1.7E-08	5.5E-09			1.4E-07	5.7E-08		
1125.4	24.3	1.9E-06	3.8E-07	1.1E-07	3.5E-08	5.7E-07	1.2E-07	1.7E-08	5.5E-09			1.4E-07	5.7E-08		
1133.2	24.6	1.8E-06	4.2E-07	1.0E-07	3.3E-08	5.8E-07	1.3E-07	1.6E-08	3.8E-09			1.4E-07	6.0E-08		
1141.2	25.0	1.9E-06	4.8E-07	1.0E-07	3.5E-08	5.9E-07	1.4E-07	1.7E-08	5.4E-09			1.4E-07	6.1E-08		
1148.9	24.6	1.9E-06	5.5E-07	1.0E-07	3.5E-08	5.9E-07	1.5E-07	1.7E-08	5.5E-09			1.5E-07	6.6E-08		
1156.3	24.3	1.9E-06	5.6E-07	1.0E-07	3.4E-08	5.9E-07	1.5E-07	1.5E-08	3.4E-09			1.5E-07	6.7E-08		
1163.5	25.4	1.8E-06	5.4E-07	1.0E-07	3.3E-08	5.8E-07	1.4E-07	1.5E-08	3.5E-09			1.5E-07	6.7E-08		
1170.6	26.3	1.8E-06	5.4E-07	1.0E-07	3.2E-08	5.7E-07	1.3E-07	1.4E-08	3.1E-09			1.5E-07	6.7E-08		
1177.5	26.4	1.8E-06	5.3E-07	1.0E-07	3.2E-08	5.7E-07	1.3E-07	1.4E-08	3.1E-09			1.5E-07	6.7E-08		
1183.9	26.0	1.8E-06	5.3E-07	1.0E-07	3.1E-08	5.7E-07	1.3E-07	1.4E-08	3.1E-09			1.5E-07	6.7E-08		
1190.2	25.0	1.7E-06	5.2E-07	1.0E-07	3.3E-08	5.6E-07	1.2E-07	1.2E-08	1.4E-09			1.4E-07	5.5E-08		

3.1 °C s^{-1}		2-Propanol		Xylene		Cresol		Dimethyl Phenol		Trimethyl Phenol		Benzene		Toluene	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
101.8	13.4	2.5E-08	4.2E-09												
111.0	14.4	2.1E-08	1.4E-09												
120.2	15.0	2.2E-08	2.0E-09												
129.8	15.7	2.1E-08	1.6E-09												
139.9	17.5	2.1E-08	9.7E-10												
150.2	19.3	2.0E-08	1.3E-09												
161.4	20.4	2.0E-08	2.6E-09												
172.4	20.2	2.0E-08	1.9E-09												
183.6	19.8	1.9E-08	1.7E-09												
195.1	19.9	1.7E-08	3.1E-10												
207.0	20.2	1.8E-08	1.6E-10												
219.1	21.6														
231.5	22.8														
244.7	22.8					1.4E-08	5.5E-09								
257.3	21.7					1.9E-08	5.4E-09	1.6E-08	6.5E-09						
270.2	20.5					2.5E-08	6.7E-09	2.8E-08	1.9E-08						
283.8	20.2					3.6E-08	1.5E-08	3.4E-08	1.6E-08	1.6E-08	4.8E-09	9.1E-09	4.6E-10		
296.4	19.9					5.3E-08	2.1E-08	4.9E-08	1.9E-08	1.6E-08	5.1E-09	9.1E-09	5.2E-10	1.0E-08	5.9E-10
308.4	20.1					6.9E-08	2.6E-08	6.1E-08	2.0E-08	1.6E-08	5.0E-09	9.3E-09	5.1E-10	1.1E-08	1.0E-09
321.3	20.6			9.1E-09	9.3E-10	9.8E-08	2.1E-08	9.2E-08	1.5E-08	2.0E-08	3.5E-09	9.4E-09	2.0E-09	1.1E-08	1.4E-09
334.9	19.8			9.8E-09	5.7E-10	1.2E-07	2.8E-08	1.1E-07	1.5E-08	1.9E-08	1.1E-09	1.2E-08	1.8E-09	1.2E-08	5.7E-10
347.7	18.2			1.5E-08	5.4E-09	1.5E-07	3.0E-08	1.2E-07	1.6E-08	2.2E-08	2.4E-09	1.3E-08	5.7E-09	1.4E-08	2.8E-09
360.3	16.6			2.3E-08	7.3E-09	1.8E-07	2.0E-08	1.4E-07	4.7E-09	2.2E-08	2.7E-09	1.6E-08	7.6E-09	1.5E-08	3.1E-09
373.4	16.0			2.7E-08	5.7E-09	1.9E-07	1.8E-08	1.5E-07	7.8E-09	2.4E-08	3.4E-09	2.3E-08	8.6E-09	3.1E-08	4.6E-09
385.5	15.1			3.6E-08	7.1E-09	2.1E-07	4.8E-09	1.5E-07	1.2E-08	2.2E-08	4.9E-09	2.5E-08	7.2E-09	4.2E-08	8.4E-09
397.1	14.5			4.5E-08	5.5E-09	2.0E-07	1.6E-08	1.4E-07	2.4E-08	2.3E-08	5.0E-09	3.0E-08	9.8E-09	4.7E-08	1.9E-08
408.3	15.4			4.9E-08	5.8E-09	1.8E-07	1.9E-08	1.2E-07	1.7E-08	2.3E-08	4.6E-09	3.3E-08	9.6E-09	6.1E-08	1.0E-08
419.0	15.7			5.7E-08	1.7E-09	1.7E-07	2.1E-08	1.1E-07	2.2E-08	0.0E+00	0.0E+00	3.3E-08	9.7E-09	6.3E-08	7.6E-09
430.1	15.3			5.4E-08	1.3E-09	1.4E-07	3.4E-08	9.1E-08	1.8E-08	0.0E+00	0.0E+00	3.8E-08	4.7E-09	6.5E-08	4.2E-09
440.1	14.3			4.5E-08	4.7E-09	1.2E-07	2.8E-08	8.6E-08	2.3E-08	0.0E+00	0.0E+00	3.8E-08	4.6E-09	6.1E-08	6.9E-10
449.9	13.5			4.0E-08	8.8E-09	1.0E-07	2.6E-08	6.6E-08	2.1E-08	0.0E+00	0.0E+00	3.8E-08	3.9E-09	5.8E-08	4.6E-09
459.5	14.0			3.6E-08	6.7E-09	8.5E-08	1.7E-08	6.2E-08	1.8E-08	0.0E+00	0.0E+00	3.7E-08	4.1E-09	5.3E-08	9.8E-09
468.7	14.9			3.3E-08	4.7E-09	7.7E-08	1.5E-08	5.3E-08	1.2E-08	0.0E+00	0.0E+00	3.6E-08	3.6E-09	4.6E-08	1.0E-08
477.7	15.8			3.1E-08	5.7E-09	6.6E-08	1.5E-08	4.4E-08	4.9E-09	0.0E+00	0.0E+00	3.4E-08	1.2E-09	3.6E-08	3.8E-09

3.1 °C s^{-1}		2-Propanol		Xylene		Cresol		Dimethyl Phenol		Trimethyl Phenol		Benzene		Toluene	
T / °C	± °C	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)	moles ·°C^{-1}	SD (1σ)
486.8	16.6			2.6E-08	5.2E-09	5.7E-08	1.4E-08	4.0E-08	8.0E-09			3.2E-08	2.6E-09	3.2E-08	6.8E-09
496.5	16.9			2.3E-08	6.8E-09	5.2E-08	1.3E-08	3.4E-08	8.4E-09			3.1E-08	3.7E-09	2.9E-08	5.9E-09
505.5	16.0			1.9E-08	1.4E-09	4.8E-08	8.9E-09	3.1E-08	6.9E-09			2.9E-08	4.6E-09	2.7E-08	5.0E-09
514.6	15.2			1.7E-08	4.1E-09	4.3E-08	8.1E-09	2.8E-08	5.1E-09			2.5E-08	2.1E-09	2.6E-08	5.4E-09
524.2	15.3			1.4E-08	1.6E-09	3.9E-08	8.7E-09	2.4E-08	5.6E-09			2.3E-08	2.8E-09	2.4E-08	6.9E-09
533.0	16.2			1.1E-08	9.8E-10	3.5E-08	5.8E-09	2.3E-08	3.9E-09			2.3E-08	2.8E-09	2.4E-08	6.8E-09
541.1	17.3			1.2E-08	1.2E-09	3.4E-08	6.7E-09	2.3E-08	3.9E-09			2.1E-08	3.9E-09	2.2E-08	5.7E-09
549.4	17.8			1.1E-08	1.5E-09	3.2E-08	4.2E-09	2.0E-08	3.7E-09			2.0E-08	4.7E-09	2.0E-08	4.4E-09
557.9	18.1			1.1E-08	1.2E-09	3.2E-08	4.7E-09	1.9E-08	2.4E-09			1.8E-08	3.2E-09	1.8E-08	4.2E-09
565.5	17.5					3.2E-08	4.5E-09	1.9E-08	2.1E-09			1.9E-08	3.3E-09	1.7E-08	1.1E-09
573.0	17.2					2.8E-08	5.0E-09	1.9E-08	2.2E-09			1.8E-08	3.7E-09	1.6E-08	1.2E-09
580.8	17.5					2.6E-08	5.2E-09	1.7E-08	4.3E-09			1.6E-08	2.0E-09	1.6E-08	1.1E-09
588.1	18.2					2.4E-08	5.5E-09	1.7E-08	3.8E-09			1.5E-08	3.0E-09	1.5E-08	2.4E-09
595.3	18.9					2.4E-08	5.5E-09	1.7E-08	3.8E-09			1.4E-08	2.0E-09	1.5E-08	1.9E-09
602.3	19.3					2.4E-08	5.7E-09	1.5E-08	3.4E-09			1.4E-08	2.6E-09	1.2E-08	1.0E-09
609.4	19.7					2.4E-08	6.0E-09					1.4E-08	2.5E-09	1.3E-08	1.2E-09
616.8	19.9					2.3E-08	4.8E-09					1.4E-08	2.5E-09	1.2E-08	1.1E-09
623.6	19.5					2.2E-08	6.0E-09					1.3E-08	2.5E-09	1.2E-08	1.1E-09
630.4	18.9					2.2E-08	5.9E-09					1.3E-08	2.5E-09	1.2E-08	1.1E-09
637.4	19.5					2.1E-08	5.0E-09					1.2E-08	2.9E-09	1.2E-08	1.1E-09
644.5	20.2					1.9E-08	6.7E-09							1.2E-08	1.1E-09
651.6	20.4					1.9E-08	6.7E-09							1.2E-08	1.1E-09
658.7	20.8													1.3E-08	1.1E-09
666.1	21.1													1.2E-08	7.3E-10
673.2	20.7														
680.5	20.5														
688.1	20.9														
695.2	21.6														
702.3	22.4														
709.4	22.6														
716.4	22.8														
723.8	22.8														
730.7	22.2														
737.7	21.6														

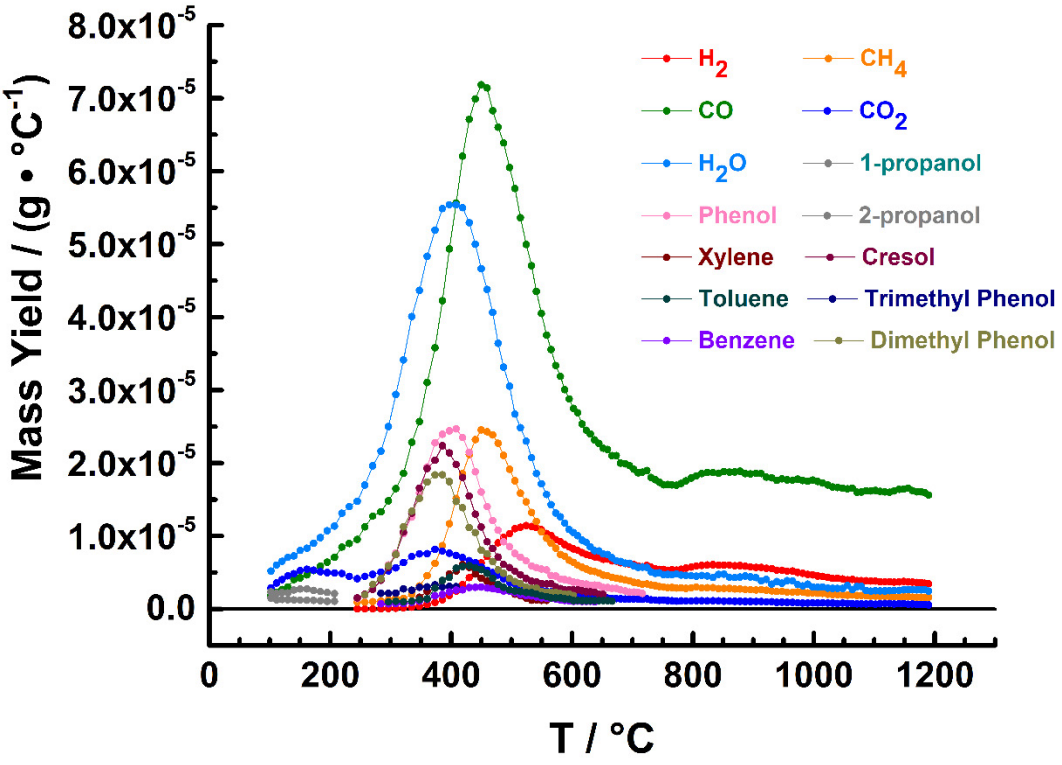

Figure S29. Mass yields of pyrolysis products as a function of nominal heating rate of PICA, measured during the pyrolysis of PICA with a nominal heating rate of 3.1 °C s^{-1}.

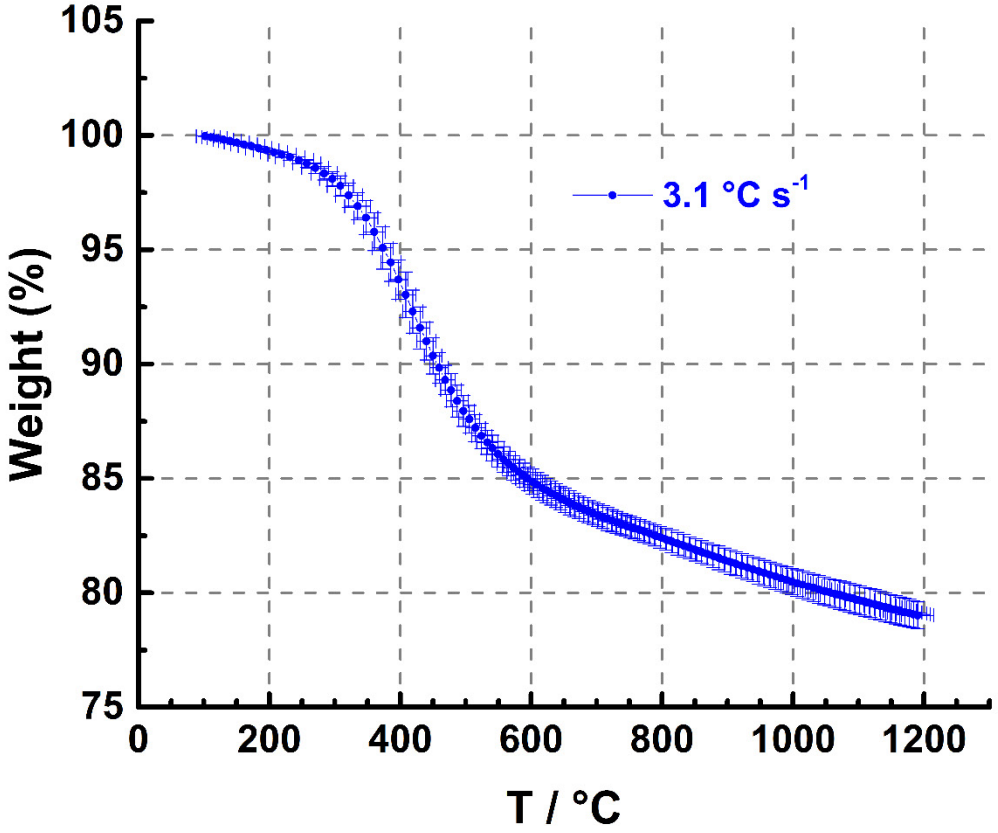

Figure S30. Simulated thermogravimetric analysis (TGA) curve of PICA, with a nominal heating rate of 3.1 °C s^{-1}.

Table S8. TGA data collected with a nominal heating rate of 3.1 °C s^{-1}.

T / °C	± °C	% Weight	± % Weight
101.8	13.4	100.0	0.0
111.0	14.4	99.9	0.0
120.2	15.0	99.9	0.0
129.8	15.7	99.8	0.0
139.9	17.5	99.8	0.0
150.2	19.3	99.7	0.1
161.4	20.4	99.6	0.1
172.4	20.2	99.5	0.1
183.6	19.8	99.4	0.1
195.1	19.9	99.4	0.1
207.0	20.2	99.3	0.1
219.1	21.6	99.2	0.1
231.5	22.8	99.0	0.1
244.7	22.8	98.9	0.2
257.3	21.7	98.8	0.2
270.2	20.5	98.6	0.2
283.8	20.2	98.3	0.3
296.4	19.9	98.1	0.3
308.4	20.1	97.8	0.4
321.3	20.6	97.4	0.5
334.9	19.8	96.9	0.6
347.7	18.2	96.4	0.7
360.3	16.6	95.8	0.8
373.4	16.0	95.1	0.9
385.5	15.1	94.4	0.8
397.1	14.5	93.7	0.9
408.3	15.4	93.0	1.0
419.0	15.7	92.3	0.9
430.1	15.3	91.6	0.9
440.1	14.3	91.0	0.8
449.9	13.5	90.4	0.8
459.5	14.0	89.8	0.7
468.7	14.9	89.3	0.6
477.7	15.8	88.9	0.7

T / °C	± °C	% Weight	± % Weight
486.8	16.6	88.4	0.7
496.5	16.9	88.0	0.7
505.5	16.0	87.6	0.6
514.6	15.2	87.2	0.6
524.2	15.3	86.9	0.6
533.0	16.2	86.6	0.5
541.1	17.3	86.3	0.6
549.4	17.8	86.1	0.6
557.9	18.1	85.8	0.6
565.5	17.5	85.7	0.5
573.0	17.2	85.5	0.5
580.8	17.5	85.3	0.5
588.1	18.2	85.1	0.5
595.3	18.9	85.0	0.5
602.3	19.3	84.9	0.5
609.4	19.7	84.7	0.5
616.8	19.9	84.6	0.5
623.6	19.5	84.5	0.5
630.4	18.9	84.4	0.5
637.4	19.5	84.3	0.5
644.5	20.2	84.1	0.5
651.6	20.4	84.0	0.5
658.7	20.8	83.9	0.5
666.1	21.1	83.8	0.5
673.2	20.7	83.7	0.5
680.5	20.5	83.6	0.5
688.1	20.9	83.6	0.5
695.2	21.6	83.5	0.5
702.3	22.4	83.4	0.5
709.4	22.6	83.3	0.5
716.4	22.8	83.2	0.5
723.8	22.8	83.2	0.5
730.7	22.2	83.1	0.5
737.7	21.6	83.0	0.5

T / °C	± °C	% Weight	± % Weight
744.6	22.1	82.9	0.5
751.4	22.6	82.9	0.5
758.3	21.8	82.8	0.5
765.3	20.9	82.7	0.5
773.0	19.8	82.7	0.5
780.6	18.3	82.6	0.5
788.7	17.0	82.5	0.5
797.0	17.5	82.4	0.5
805.8	18.0	82.3	0.5
814.8	17.7	82.3	0.5
823.7	17.6	82.2	0.5
833.3	17.4	82.1	0.5
842.4	16.6	82.0	0.5
851.3	15.8	81.9	0.5
860.6	15.8	81.8	0.5
869.4	16.6	81.7	0.5
878.0	17.6	81.6	0.5
886.6	17.7	81.5	0.5
895.2	17.8	81.4	0.5
904.4	17.9	81.3	0.5
913.0	17.2	81.3	0.5
921.7	16.7	81.2	0.5
930.4	17.6	81.1	0.5
938.9	18.8	81.0	0.5
947.5	18.9	80.9	0.6
956.1	19.0	80.9	0.6
965.0	19.3	80.8	0.6
973.4	18.7	80.7	0.6
981.8	18.3	80.6	0.6
990.1	19.3	80.6	0.6
998.2	20.5	80.5	0.6
1006.5	20.7	80.4	0.6
1014.7	21.0	80.4	0.6
1023.3	21.3	80.3	0.6

T / °C	± °C	% Weight	± % Weight
1031.2	20.7	80.2	0.6
1039.1	20.3	80.2	0.6
1047.8	20.5	80.1	0.6
1055.9	21.5	80.0	0.6
1063.8	22.5	80.0	0.6
1071.4	22.8	79.9	0.6
1078.8	23.1	79.8	0.6
1086.6	23.4	79.8	0.6
1094.4	23.0	79.7	0.6
1102.1	22.4	79.7	0.6
1109.8	23.3	79.6	0.6
1117.6	24.1	79.6	0.6
1125.4	24.3	79.5	0.6
1133.2	24.6	79.4	0.6
1141.2	25.0	79.4	0.6
1148.9	24.6	79.3	0.6
1156.3	24.3	79.3	0.6
1163.5	25.4	79.2	0.6
1170.6	26.3	79.2	0.6
1177.5	26.4	79.1	0.6
1183.9	26.0	79.1	0.6
1190.2	25.0	79.0	0.6