## S1. Supplemental figures and tables for experimental results

**Table S1.** A summary of experimental conditions for a flow reactor.

| Set | Fuel (%) | $N_2$ (%) | $O_2$ (%) | Total flow rate at reactor inlet (sccm) | Temp.(K) | Residence time (s) |
|---|---|---|---|---|---|---|
| Toluene fuel-rich oxidation -temperature dependence- | | | | | | |
| 1 | 0.60 | 98.8 | 0.60 | 714.7 | 1050 | 1.2 |
| 2 | 0.60 | 98.8 | 0.60 | 652.6 | 1150 | 1.2 |
| 3 | 0.60 | 98.8 | 0.60 | 600.4 | 1250 | 1.2 |
| 4 | 0.60 | 98.8 | 0.60 | 555.9 | 1350 | 1.2 |
| Toluene fuel-rich oxidation -residence time dependence at 1300 K- | | | | | | |
| 1 | 0.60 | 98.8 | 0.60 | 2950.1 | 1300 | 0.2 |
| 2 | 0.60 | 98.8 | 0.60 | 1614.7 | 1300 | 0.4 |
| 3 | 0.60 | 98.8 | 0.60 | 1112.3 | 1300 | 0.6 |
| 4 | 0.60 | 98.8 | 0.60 | 865.9 | 1300 | 0.8 |
| 5 | 0.60 | 98.8 | 0.60 | 692.7 | 1300 | 1.0 |
| 6 | 0.60 | 98.8 | 0.60 | 577.3 | 1300 | 1.2 |
| Toluene fuel-rich oxidation -residence time dependence at 1150 K- | | | | | | |
| 1 | 0.60 | 98.8 | 0.60 | 1803.7 | 1150 | 0.4 |
| 2 | 0.60 | 98.8 | 0.60 | 1248.2 | 1150 | 0.6 |
| 3 | 0.60 | 98.8 | 0.60 | 978.8 | 1150 | 0.9 |
| 4 | 0.60 | 98.8 | 0.60 | 652.6 | 1150 | 1.2 |
| 5 | 0.60 | 98.8 | 0.60 | 522.1 | 1150 | 1.5 |
| Anisole pyrolysis | | | | | | |
| 1 | 0.50 | 99.50 | - | 1125.7 | 800 | 1.0 |
| 2 | 0.50 | 99.50 | - | 1059.5 | 850 | 1.0 |
| 3 | 0.50 | 99.50 | - | 1000.6 | 900 | 1.0 |
| 4 | 0.50 | 99.50 | - | 947.9 | 950 | 1.0 |
| 5 | 0.50 | 99.50 | - | 900.5 | 1000 | 1.0 |
| 6 | 0.50 | 99.50 | - | 857.7 | 1050 | 1.0 |
| 7 | 0.50 | 99.50 | - | 818.7 | 1100 | 1.0 |
| 8 | 0.50 | 99.50 | - | 783.1 | 1150 | 1.0 |
| 9 | 0.50 | 99.50 | - | 750.4 | 1200 | 1.0 |
| 10 | 0.50 | 99.50 | - | 720.4 | 1250 | 1.0 |
| 11 | 0.50 | 99.50 | - | 692.7 | 1300 | 1.0 |
| 12 | 0.50 | 99.50 | - | 667.1 | 1350 | 1.0 |
| 4-Methylanisole pyrolysis | | | | | | |
| 1 | 0.50 | 99.50 | - | 1125.7 | 800 | 1.0 |
| 2 | 0.50 | 99.50 | - | 1059.5 | 850 | 1.0 |
| 3 | 0.50 | 99.50 | - | 1000.6 | 900 | 1.0 |
| 4 | 0.50 | 99.50 | - | 947.9 | 950 | 1.0 |
| 5 | 0.50 | 99.50 | - | 900.5 | 1000 | 1.0 |
| 6 | 0.50 | 99.50 | - | 857.7 | 1050 | 1.0 |
| 7 | 0.50 | 99.50 | - | 818.7 | 1100 | 1.0 |
| 8 | 0.50 | 99.50 | - | 783.1 | 1150 | 1.0 |
| 9 | 0.50 | 99.50 | - | 750.4 | 1200 | 1.0 |
| 10 | 0.50 | 99.50 | - | 720.4 | 1250 | 1.0 |
| 11 | 0.50 | 99.50 | - | 692.7 | 1300 | 1.0 |
| 12 | 0.50 | 99.50 | - | 667.1 | 1350 | 1.0 |