Supplementary information

A sensitivity analysis of a numbered-up photomicroreactor system

S1. Reaction kinetics

The kinetic constant is determined for a single operating photomicroreactor and is shown in Figure S1. This value is used to verify the assumption of first order kinetics with respect to thiophenol, the substrate, and to predict yield (*Y*) in the scaled-up system under blockage circumstances. Figure S1 shows the plot of standard first order kinetics, with on the Y-axis the yield and on the X-axis the residence time (τ) in the reactor. The used mathematical formulas, Equations 6 and 7 are shown in the paper. It clearly shows the first order in kinetics with respect to thiophenol with a kinetic constant (κ) of 0.0593 s^{-1}. With this parameter the yield under blockage was calculated according to Equations 5-9 in the paper.

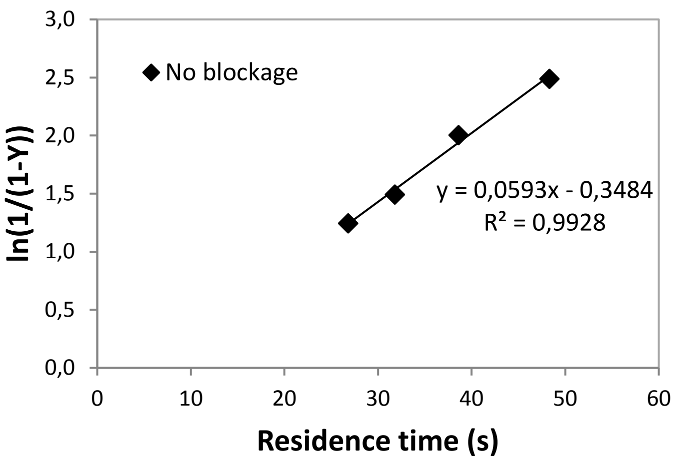

Figure S1: Kinetic analysis of the dimerization of thiophenol in a single photomicroreactor

S2. Deviation on yield

All measurements were done at least in duplo and show quite stable performance in terms of yield, which is analyzed via GC-FID (GC-2010 Plus, Shimadzu). This is shown in Figure S2, were it can be observed that the deviation on these yield measurements is generally below 5%, which is reasonably low compared to the deviation in throughput shown in Figure 3C. This can be explained by the weighted average that is used to calculate the yield and therefore the standard deviation on this yield (Equations 3 and 4) and by the fact that these measurements were done at high conversion, meaning that these values lay at the end of the conversion/yield curve. Also the experimental error and the error on the measurement via GC-FID give obviously some off-set.

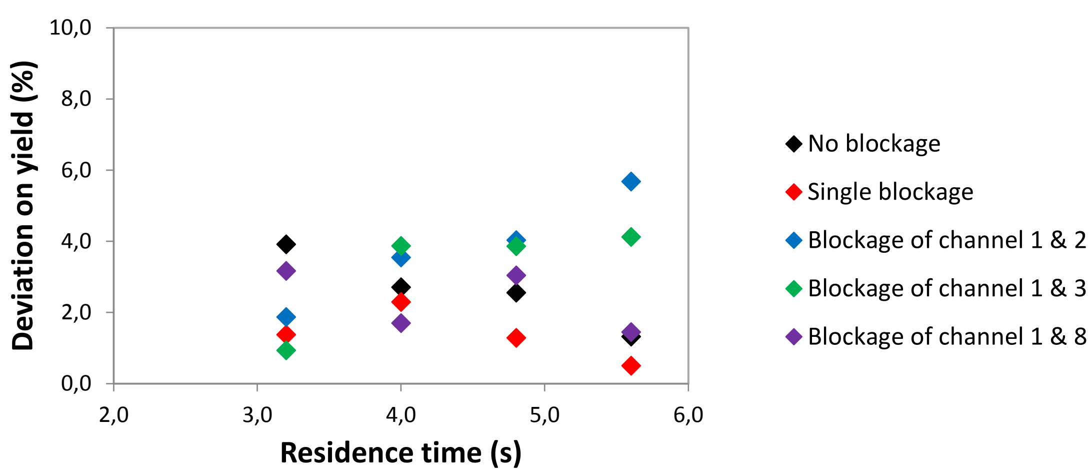

Figure S2: Deviation on yield for the blockage experiments

S3. Yield prediction upon blockage

According to Equations 8 and 9 (main article), the theoretical yield can be calculated and compared to the experimental results. For the case of single blockage, 7 out of 8 reactors still function, therefore τ_2/τ_1 = 7/8. Analogous for double blockage τ_2/τ_1 = 6/8. Both the theoretical and experimental yield ratios () for single blockage and the double blockage scenarios are shown in Tables S1 and S2 until S4, respectively. Also the correction factors for these experiments are shown in these tables. Table S5 shows the confidence intervals for the correction factor (f_c) both for the theoretical correction factor (f_c = 1) and the average correction factor per scenario ($\overline{f_c}$).

From Table S5 we can conclude that applying the experimentally conceived correction factor is as accurate as the theoretical factor of 1. Also the standard deviation is small, so the theoretical yield gives a good indication of the performance of the system in terms of yield.

Table S1: Yield prediction for the single blockage case

τ_1 (s)	Theoretical Y_2/Y_1	Experimental Y_2/Y_1	f_c
26.8	0.994	0.917	0.972
31.8	0.952	0.947	0.994
38.6	0.963	0.955	0.992
48.3	0.974	0.968	0.994

Table S2: Yield prediction for the double blockage 1&2 case

τ_1 (s)	Theoretical Y_2/Y_1	Experimental Y_2/Y_1	f_c
26.8	0.875	0.875	1.000
31.8	0.892	0.865	0.969
38.6	0.913	0.901	0.987
48.3	0.937	0.948	1.012

Table S3: Yield prediction for the double blockage 1&3 case

τ_1 (s)	Theoretical Y_2/Y_1	Experimental Y_2/Y_1	f_c
26.8	0.875	0.853	0.974
31.8	0.892	0.879	0.985
38.6	0.913	0.868	0.951
48.3	0.937	0.939	1.002

Table S4: Yield prediction for the double blockage 1&8 case

τ_1 (s)	Theoretical Y_2/Y_1	Experimental Y_2/Y_1	f_c
26.8	0.875	0.883	1.010
31.8	0.892	0.857	0.960
38.6	0.913	0.874	0.957
48.3	0.937	0.937	1.000

Table S5: Confidence intervals for yield prediction

Case	$f_c \pm \sigma$	$\overline{f_c} \pm \sigma$
Single blockage	1 ± 0.009	0.988 ± 0.010
Double blockage – channel 1&2	1 ± 0.016	0.992 ± 0.016
Double blockage – channel 1&3	1 ± 0.019	0.978 ± 0.019
Double blockage – channel 1&8	1 ± 0.023	0.982 ± 0.024