Electronic Supplementary Material (ESI) for Reaction Chemistry & Engineering.

Supporting information

Bubble formation in catalyst pores; curse or blessing?

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Table S1: Nanochannels studied and their characteristics.

Nanochannel ID	Nanochannel length (μm)	Nanochannel width (μm)	Catalyst length (μm)	Catalyst width (μm)
L1,1	2900	10	35	6
L1,2	2900	30	35	26
L1,3	2900	50	35	46
L1,4	2900	70	35	66
L1,5	2900	10	180	6
L1,6	2900	30	180	26
L1,7	2900	50	180	46
L1,8	2900	70	180	66
L1,9	2900	10	250	6
L1,10	2900	30	250	26
L1,11	2900	50	250	46
L1,12	2900	70	250	66
L2,1	8500	10	35	6
L2,2	8500	30	35	26
L2,3	8500	50	35	46
L2,4	8500	70	35	66
L2,5	8500	10	250	6
L2,6	8500	30	250	26
L2,7	8500	50	250	46
L2,8	8500	70	250	66
L2,9	8500	10	3140	6
L2,10	8500	30	3140	26
L2,11	8500	50	3140	46
L2,12	8500	70	3140	66
L3,1	14000	10	35	6
L3,2	14000	30	35	26
L3,3	14000	50	35	46
L3,4	14000	70	35	66
L3,5	14000	10	250	6
L3,6	14000	30	250	26
L3,7	14000	50	250	46
L3,8	14000	70	250	66
L3,9	14000	10	3140	6
L3,10	14000	30	3140	26
L3,11	14000	50	3140	46
L3,12	14000	70	3140	66

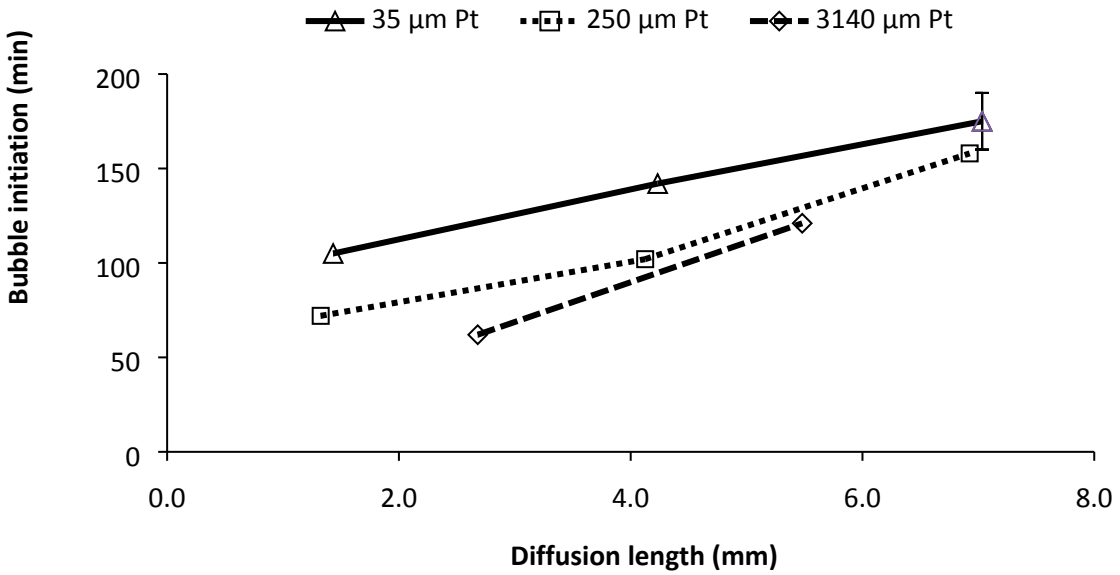

Figure S1: Effect of the diffusion length and the Pt length on the bubble initiation time for a constant nanochannel width of 50 µm and different platinum lengths (35, 250 and 3140 µm). The experiments were performed with 0.64 mole H_2O_2/L.

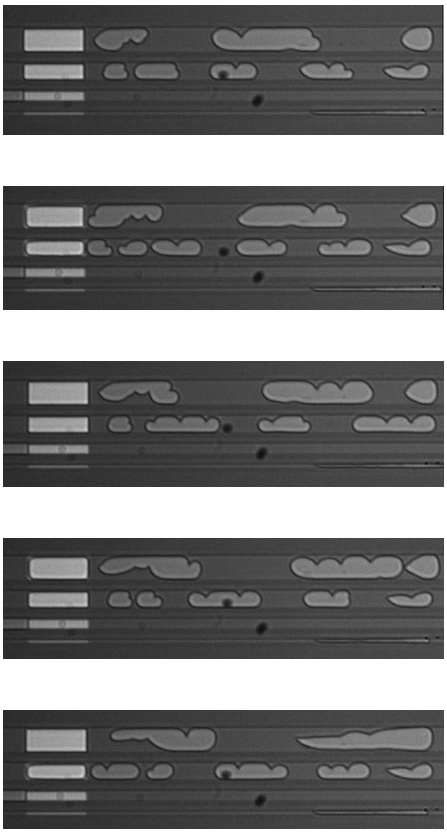

Figure S2: Evolution of the bubbles growing towards the microchannel filled with H_2O after 532 min of experiment. Images were taken every 1.1 second. Nanochannels have a length of 2.9 mm, widths of 10, 30, 50 and 70 µm and a platinum length of 180 µm. The experiment was performed with a solution of 0.64 mole H_2O_2/L.

L4 ab
32h40min_7fps.avi

Movie S3. Real time movie of the experiment with a H_2O_2 concentration of 1.49 mole/L, shown in table 1. Recording performed after 32h and 40min of reaction time.

Calculation of H_2O_2 conversion

The conversion of H_2O_2 in the experiments with bubble formation towards the nanochannel filled with water (presence of convective flow) was calculated according to Equation F1:

$$Conversion\ H_2O_2 = \frac{H_2O_2\ converted}{H_2O_2\ fed} * 100 = \frac{\frac{2 * \left(V_{O_2,f} - V_{O_2,i}\right)}{t_f - t_i} * \frac{P}{R * T}}{v * A * [H_2O_2]} * 100$$

Equation F1

Where $V_{O_2 f}$ and $V_{O_2 i}$ (m^3) are the volumes of the oxygen bubble at times t_f and t_i (s) respectively; P is the pressure in the nanochannel (1 + ΔP bar), R (m^3 * bar * K^{-1} * mol^{-1}) is the constant of ideal gases, T (K) is the temperature in the nanochannel, v (m * s^{-1}) is the linear velocity of the liquid in the nanochannel, A (m^2) is the cross-sectional area of the nanochannel and [H_2O_2] (mole * m^{-3}) is the concentration of H_2O_2 in the feed stream.