

# Novel Microfluidic Approach for Extremely Fast and Efficient Photochemical Transformations using Fluoropolymer Microcapillary Films

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## Electronic Supplementary Information

### Materials and Methods

Aqueous solutions were made from bacteria free Milli-Q® ultrapure water of 18.2 MΩ/cm resistivity with less than 1 ppb total organic carbon (Millipore, MA, USA). The virus inactivation experiments in Figure 3a (see manuscript) were carried out at  $u_{mean} = 12.5$  mm/s, using a short 206 μm MCF strip connected to an IVAC P2000 infusion pump (Alaris Medical UK Ltd, Basingstoke, UK) irradiated at a distance of 15 mm by a parallel 5W PL-S5 TUC compact 253.7 nm germicidal lamp (Lamp Specs, Tolworth, UK). The experiments shown in Figure 3b-d were carried out using a MCF microreactor wrapped around a 8 W, 253.7 nm tubular germicidal lamp (Germicidal G8T5, GE Lighting, Northampton, UK) connected to a Vici M6 pump (VICI Ag International, Schenkon, Switzerland) using Upchurch connectors (IDEX Health & Science, WA, USA). The measured lamp irradiance was 17.9 mW/cm<sup>2</sup>, which is the same used for the photobleaching experiments in Figure 2c for both the MCF and 1 cm cuvette. The internal volume of the different MCFs in Figure 3b (see manuscript) was kept constant at 0.15 ml, by fixing the different exposed length,  $L$  to 1800, 756 and 518 mm for the large, medium and small bore MCFs, respectively. Diclofenac (Sigma-Aldrich, Dorset, UK) was dissolved in water and pumped at a flow rate of 2 ml/min, corresponding to  $u_{mean} = 115.2$  mm/s. BLG (Sigma-Aldrich, Dorset, UK) and H<sub>2</sub>O<sub>2</sub> (Sigma-Aldrich, Dorset, UK) were diluted in ultrapure water at a concentration of BLG of 0.0273 mM and molar ratio of 17.4 for H<sub>2</sub>O<sub>2</sub>/BLG, and pumped at flow rate of 1.0 ml/min, i.e.  $u_{mean} = 57.6$  mm/s.

The concentration of diclofenac and indigo carmine (MW = 466.35 g/mol, Sigma-Aldrich, Dorset, UK) was measured using a Lambda 35 UV/VIS spectrophotometer at 254 nm and 610 nm (Perkin Elmer, MA, USA), respectively, and BLG measured by HPLC (1100 Agilent) equipped with a Gemini C18 (Phenomenex) reverse phase column and a diode array UV/VIS detector ( $\lambda = 232$  and  $274$  nm) using a mixture of formic acid (25 mM) and acetonitrile as the mobile phase flowing at 0.8 ml/min.

The residence time distributions shown in Figures 2a-2c (see manuscript) were performed by injecting a step of 1000 mg/l Blue Dextran 70 (Sigma-Aldrich, Dorset, UK) at a flow rate of 0.5 ml/min, and measuring real-time the absorbance in the whole set of 10 microcapillaries with an Actipix UV microfluidic monitor (Paraytec, York, UK) equipped with a 214 nm dichroic filter. The total distances from the injection point to the detector were 1740 mm and 730 mm and  $u_{mean} = 42.0$  mm/s and 100.0 mm/s for the medium bore ( $d_h = 159 \pm 12$   $\mu\text{m}$ ) and the small bore ( $d_h = 103 \pm 7$   $\mu\text{m}$ ) MCFs, respectively.