# Photocatalytic NOx removal with TiO2-impregnated 3D-printed PET supports

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## **Infill Density Selection**

The best PET load inside the monolith, i. e., the empty inner volume of each one, was was selected by measuring the UV light transmittance through monoliths of 5, 10, 15, 20 and 30% infill density. Each monolith was placed 2 cm from the UVLED where a reference irradiance of I0 = 3480 μW/cm2 was measured with a Spectroline Model DM-365 XA radiometer. Then, the irradiance of the UV light outcoming the monoliths was measured (Figure S1 a)) was measured and the results are displayed in Figure S1 b). The best infill density was 15%.

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| --- |
| b)a) |
| c) | d) |

Figure S 1. a) experimental setup for optimal infill density selection; b) irradiance measured after UV-light passed across the monolith; c) gas flow scheme inside the reactor (G1: gas stream 1, NO 40 ppm; G2: gas stream 2, treated NO); d) deconstructed sight of the planar reactor (A: Nylon flange, B: 240 × 6.5 mm Pyrex glass windows; C: 280 × 15 mm Teflon body)

In Figure S1 b a detailed composition of the flat PTFE reactor is shown. The

Effect of the amount of TiO2 layers

Figure S 2. Net removal of NO and NOX for 1, 2 or 3 TiO2 layers after each impregnation run and the amount of TiO2 deposited in each impregnation run. Filament: BPET; TiO2: P25; UV source: UV-LED

## **Effect of filament composition**

**Figure S 3.** Net removal of NO and NOX for P25@BPET and P25@PETG under irradiation with the UV-LED and the amount of TiO2 deposited in each case.

## **Effect of TiO2 type**

|  |  |
| --- | --- |
| a) | b) |
| c) | d) |

**Figure S 4.** time resolved profiles of a) NOx, b) NO, c) NO2 concentration and d) S during the photocatalytic removal of NO.

Table S 1. Relevant characteristics of P25 and UV100 [1].

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **TiO2** | **Composition** | **Size (nm)** | **S.S.A. (g/m2)** | **Relative surface water (H2OsurfUV100/ H2OsurfP25)** |
| P25 | 80% A/20%R | 32 | 49 | 1.57 |
| UV100 | 100% A | 10 | 270 |

A: anatase; R: rutile

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **#** | **TiO2 layers** | **PET**  | **Light source** | **TiO2** | **H2O** | **RNOx****(µmol/gTiO2)** | **RNO****(µmol/gTiO2)** | **S(%)** | **RDeNOX** |
| 1 | 1 | BPET | UVLED | P25 | No | 38.8 ± 5.6 | 51.4 ± 9.1 | 71.0 ± 2.2 | 7.1 |
| 2 | 2 | BPET | UVLED | P25 | No | 29.8 ± 7.4 | 32.4 ± 8.7 | 86.7 ± 1.9 | 20.6 |
| 3 | 3 | BPET | UVLED | P25 | No | 27.3 ± 4.0 | 32.8 ± 2.7 | 77.8 ± 4.9 | 11.7 |
| 4 | 1 | PETG | UVLED | P25 | No | 95.2 ± 17.2 | 111.8 ± 16.1 | 79.9 ± 2.9 | 47.3 |
| 5 | 1 | PETG | BLT | P25 | No | 322.5 ± 18.5 | 334.2 ± 10.9 | 91.1 ± 2.3 | 259.5 |
| 6 | 1 | PETG | BLT | UV100 | No | 658.4 ± 64.3 | 1355.6 ± 133.8 | 42.9 ± 4.3 | -1094.2 |
| 7 | 1 | PETG | UVLED | P25 | Yes | 218.6 ± 20.7 | 250.5 ± 23.9 | 76.1 ± 7.6 | 81.3 |

Table S 2. Percentual selectivity, RNOx, RNO and RDeNOX for each NO removal xperiment.

**References**

[1] A.Y. Nosaka, T. Fujiwara, H. Yagi, H. Akutsu, Y. Nosaka, Characteristics of water adsorbed on TiO2 photocatalytic systems with increasing temperature as studied by solid-state1H NMR Spectroscopy, Journal of Physical Chemistry B. 108 (2004) 9121–9125. https://doi.org/10.1021/jp037297i.