DeNOxing the air in urban spaces by building and construction photocatalytic coverings

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Table S1. Substrate, photocatalytic product and its application method.

Name	Substrate	Photocatalytic product	Application method
$(PS\text{-}WD)_1$	Paving slab	Low-transparency water-based sol with TiO_2 additive	Paint roller
$(PS\text{-}WD)_2$	Paving slab	Water-based polymeric microemulsion with TiO_2 additive	Sprayer
$(PS\text{-}WD)_3$	Paving slab	Water-based polymeric microemulsion with TiO_2 additive	Sprayer
$(PS\text{-}WD)_4$	Paving slab	Moderate-transparency water-based sol with TiO_2 additive	Paint roller
$(PS\text{-}WD)_5$	Paving slab	Water-based polymeric microemulsion with TiO_2 additive	Sprayer
$(PS\text{-}WD)_6$	Paving slab	Water-based polymeric microemulsion with TiO_2 additive	Sprayer
$(PS\text{-}WD)_7$	Paving slab	Water-based polymeric microemulsion with TiO_2 additive	Sprayer
$(PS\text{-}WD)_8$	Paving slab	Water-based polymeric microemulsion with TiO_2 additive	Sprayer
$(PS\text{-}WD)_9$	Paving slab	Water-based polymeric microemulsion with TiO_2 additive	Sprayer
$(PS\text{-}WD)_{10}$	Paving slab	TiO_2 sol-gel	Sprayer
$(PPS)_1$	Paving slab	Anatase-TiO_2 solution embedded in the surface	
$(PPS)_2$	Paving slab	N/D	
$(PPB)_1$	Paving block	Anatase-TiO_2 solution embedded in the surface	
$(PPB)_2$	Paving block	Nano-TiO_2 embedded in the surface	
$(PPB)_3$	Paving block	N/D	
$(PPB)_4$	Paving block	Nano-TiO_2 embedded in the surface	
$(BM\text{-}WD)_1$	Close-graded bituminous mixture AC16S	TiO_2 dispersion based on water and resins	Sprayer
$(BM\text{-}WD)_2$	Close-graded bituminous mixture AC16S	Water-based polymeric microemulsion with TiO_2 additive	Sprayer
$(BM\text{-}WD)_3$	Open-graded bituminous mixture BBTM 11B	Water-based polymeric microemulsion with TiO_2 additive	Sprayer
$(BM\text{-}CG)_1$	Open-graded bituminous mixture BBTM 11B	Cement grout with nano-anatase TiO_2 additive	Paint roller
$(BM\text{-}CG)_2$	Open-graded bituminous mixture BBTM 11B	Cement grout with nano-anatase TiO_2 additive	Paint roller
$(BM\text{-}CG)_3$	Open-graded bituminous mixture BBTM 11B	Cement grout with nano-TiO_2 additive	Paint roller
$(CS\text{-}FC)_1$	Concrete surface	Water-based covering with anatase-TiO_2 additive	Immersion

$(CS\text{-}FC)_2$	Concrete surface	Silicate microemulsion and silica nanoparticles in aqueous dispersion with nano-TiO_2 additive	Paint roller
$(FB\text{-}FC)_1$	Facing brick	Water-based covering with anatase-TiO_2 additive	Immersion
$(FB\text{-}FC)_2$	Facing brick	Water-based emulsion with TiO_2 additive	Paint roller
$(FB\text{-}FC)_3$	Facing brick	Moderate-transparency water-based sol with TiO_2 additive	Paint roller
$(FB\text{-}FC)_4$	Facing brick	Water-based emulsion with TiO_2 additive	Paint roller
$(FB\text{-}FC)_5$	Facing brick	Water-based emulsion with TiO_2 additive	Paint roller
$(FB\text{-}FC)_6$	Facing brick	Water-based dispersion with TiO_2 additive	Paint roller
$(FB\text{-}FC)_7$	Facing brick	Water-based covering with TiO_2 additive	Paint roller

Table S2. Impact of physical parameters on NO and NO_x removal efficiency and nitrate selectivity.

			(c) System parameters range				(d) Dependence on system parameters			
(a) Photocatalytic material	Flow-type photoreactor	(b) $\chi_{j\ (j=NO,\ NO_x)}$, S (%)	UV-A Irradiance, I (W m^{-2})	Inlet [NO], $[NO]_i$ (ppm_v)	Relative Humidity, RH (%)	Flow rate, FR (L min^{-1})	χ_{NO} (%)	χ_{NO_x} (%)	S (%)	Ref
P25 slurry	TiO_2 thin film coated tube		*($[NO]_i$=5-40, RH=50)* 2-8	*(I=2.6, RH=50)* 5-60	*(I=2.6, $[NO]_i$=40)* 0-75	0.4	I: 15-74; $[NO]_i$: 70-15; RH: 0-35		I: 82-100; $[NO]_i$: 90-100; RH: 100	Devahasdin et al., 2003
TiO_2-slurry on asphalt/TiO_2-paving block	Based on ISO 22197-1:2007	(*) (slurry on asphalt/paving block) NO: 3-38/4-45	*($[NO]_i$=1, RH=50, FR=3)* 0.3-13	*(I=10, RH=50, FR=3)* 0.1-1	*(I=10, $[NO]_i$=1, FR=3)* 10-80	*(I=10, $[NO]_i$=1, RH=50)* 1-5	(paving block) I: 5-24; $[NO]_i$: 68-37; RH: 30-15; FR: 67-22			Hüsken et al., 2009
TiO_2-concrete paving stone	ISO 22197-1:2007		*($[NO]_i$=1, RH=50, FR=3)* 0.3-13	*(I=10, RH=50, FR=3, 5)* 0.1-1	*(I=10, $[NO]_i$=1, FR=3)* 10-80	*(I=10, $[NO]_i$=0.1-1, RH=50)* 3, 5	I: 0-29; $[NO]_i$: 69-22; RH: 36-20; FR=69-22	I: 0-24; $[NO]_i$: 64-16; RH: 36-20; FR=64-16		Ballari et al., 2010
TiO_2-concrete paving stone	Based on ISO 22197-1:2007		10	*(FR=1-5)* 0.1-1	50	*($[NO]_i$=0.1-1)* 1-5		$[NO]_i$: 89-22; FR: 89-22		Hunger et al., 2010
P25 powder-pressed/P25 paint film	Based on ISO 22197-1:2007	(**) *(I=7, $[NO]_i$=1, RH=50, FR=0.7)* (powder-pressed/paint) NO: >60/15-50; S: 42-75/15-40								Águia et al., 2011
TiO_2-concrete paving stone	ISO 22197-1:2007	(*) NO: 43; NO_x: 35	*($[NO]_i$=0.52, RH=50)* 2–11	*(I=10, RH=50)* 0.1-1	*(I=10, $[NO]_i$=0.52)* 10-70	3	I: 20-58; $[NO]_i$: 83-43; RH: 89-49	I: 15-50; $[NO]_i$: 72-35; RH: 85-38		Ballari et al., 2011

TiO_2-nanosized coating over mortar/glass	Based on ISO 22197-1:2007	(**) *(I=5.8, $[NO]_i$=0.4, RH=31, FR=1.5)* (mortar/glass) NO: 45/37.5	5.8	*(RH=31, FR=1.5)* 0.1-2	*($[NO]_i$=0.4-2, FR=1.5)* 0-74	*($[NO]_i$=0.4, RH=31)* 1-5	(mortar/glass) $[NO]_i$: 45-38/48-35; RH: 45-22/45-25 (mortar) FR: 52-20	(mortar/glass) $[NO]_i$: 45-35/45-15; RH: 45-22/44-12 (mortar) FR: 52-19		Martinez et al., 2011
TiO_2-mortar on concrete paving	Based on ISO 22197-1:2007		*(RH=30-70, FR=1-5)* 10-40	20	*(I=10-40, FR=1-5)* 30-70	*(I=10-40, RH=30-70)* 1-5		I: 10-90; RH: 90-10; FR: 90-10		de Melo and Trichês, 2012
Nanotubular TiO_2 film	Continuous-flow Reactor (1 L)		1.4	*(FR=1-2.5)* 0.2-1	40	*($[NO]_i$=0.2-1)* 1-2.5	$[NO]_i$: 22.6-4.4; FR: 22.6-4.4			Kontos et al., 2012
TiO_2-water suspension onto concrete paving block	ISO 22197-1:2007	(*) NO: 47; NO_x: 39								Ballari and Brouwers, 2013
TiO_2-water suspension onto asphalt pavement	JIS R 1701-1:2004 (n.d.)	(**) *(I=20, $[NO]_i$= 0.43, RH=50, FR=1.5)* NO: 51-77; NO_x: 39-66	*(RH=50, FR=1.5)* 5-24	0.43	*(I=20, FR=1.5)* 20-80	*(I=20, RH=50)* 1.5-3	I: 31-65; RH: 65-9; FR: 65-38	I: 25-55; RH: 55-8; FR: 55-29		Hassan et al., 2013
P25 or PC500 paint/PC500 powder-pressed	Based on ISO 22197-1:2007	(**) *(I=10; $[NO]_i$=1, RH=50, FR=0.7)* (paint/powder-pressed) NO: 25-70/95; S: 25-45/45								Ângelo et al., 2014
TiO_2-mortar slab	ISO 22197-1:2007		*($[NO]_i$=1, RH=50, FR=3)* 2-15	*(I=10, RH=50, FR=3)* 0.11-1	*(I=10, $[NO]_i$=1, FR=3)* 10-70	*(I=10, $[NO]_i$=1, RH=50)* 1.5-5	I: 11-31; $[NO]_i$: 61-36; RH: 50-27; FR: 49-21	I: 7-24; $[NO]_i$: 43-29; RH: 45-20; FR: 42-16		Sikkema et al., 2015
TiO_2 onto glass	Based on ISO 22197-1:2007		10	0.5	25-65	1.2	RH: 94-82		RH : 91-51	Hernández Rodríguez et al., 2016

TiO_2-coating onto asphalt/ concrete	CSTR stirred flow tank (148 L)		*(RH=8)* (asphalt) 8-80	0.12	*(I=41)* 8-80	10	(asphalt/concrete) (1) I: 0.3-1.1/ND; RH: 0.5-0.07/6-0.08		Toro et al., 2016
nano-TiO_2 concrete	Based on JIS R1701-1:2004 (n.d.)		*($[NO]_i$=1, RH=30, FR=3)* 0.3-3	*(I=2, RH=30, FR=3)* 0.15-2	*(I=2, $[NO]_i$=1, FR=3)* 10-80	*(I=2, $[NO]_i$=1, RH=30)* 0.5-9		I: 11-60; $[NO]_i$: 68-20; RH: 60-21; FR: 88-13	Guo et al., 2017
TiO_2-coating onto mortar/wood	Based on ISO 22197-1:2007		1, 3.3	0.4	34	1.5	(mortar/wood) I: 46-50/31-48		Hot et al., 2017
P25 paint/P25 water suspension onto concrete/ plaster	Based on ISO 22197-1:2007 and CEN	(*) (ISO/CEN) NO_x: 8-24/28-42 (paint/water suspension) NO_x: 12-42/8-30 (concrete/plaster) NO_x: 8-42/16-35	10	0.1	50	3		(paint) (ISO/CEN) 17-50/32-45 (concrete/plaster) 45-50/17-32	Zouzelka and Rathousky, 2017
TiO_2-cement based coating on sandblasted glass	Based on ISO 22197-1:2007	(**) *(I=21, $[NO]_i$=0.1, RH=50, FR=3)* (1) NO: 0.51-0.57	*($[NO]_i$=0.1, RH=50, FR=3)* 3-21	*(I=21, RH=50, FR=3)* 0.05-0.5	*(I=21, $[NO]_i$=0.1, FR=3)* 0-83	*(I=21, $[NO]_i$=0.1, RH=50)* 2-7	(1) I: 0.13-0.23; $[NO]_i$: 0.37-0.15; RH: 0.6-0.17; FR: 0.3		Mothes et al., 2018
NP400 on cement paste/mortar	ISO 22197-1:2007	(*) (cement paste/mortar) NO: 3-55/11-70							Rhee et al., 2018
TiO_2-solgel onto ceramic	ISO 22197-1:2007		*($[NO]_i$=1, FR=3)* 2.5-10	*(I=10, FR=3)* 0.5-2	50	*(I=10, $[NO]_i$=1)* 1.5-4	I: 32-62; $[NO]_i$: 65-57; FR: 82-40		Muñoz et al., 2019

P25 mortar	ISO 22197-1:2007		*(RH=35, FR=1)* 10-40	10	*(I=40, FR=1)* 35-65	*(I=40, RH=35)* 1-5		I: 22-81; RH: 81-12; FR: 81-21		Casagrande et al., 2020
P25/TiO_2-powdered cement onto glass/asphalt	ISO 22197-1:2007	(*) (TiO_2-powdered cement–asphalt) NO: 29; NO_x: 22	10	5	50	0.1	(P25–glass) 93 (TiO_2-powdered cement–glass/ asphalt) 20/32			Suárez et al., 2020
TiO_2-dispersion paint	Based on ISO 22197-1:2007		2.1	0.09	6-84	2.2	RH: 93-15			Pill et al., 2021
TiO_2-powder in cement mortar **TiO_2-supported aggregates in/on cement mortar**	ISO 22197-1:2007	(*) (powder in cement mortar) NO: 34; NO_x: 33; S: 98 (aggregates in/on cement mortar) NO: 51/52; NO_x: 51/50; S: 100-98	solar light simulator	*(RH=50, FR=3)* 0.05-2	*($[NO]_i$=1, FR=3)* 17-83	*($[NO]_i$= 1, RH=50)* 1-5	(aggregates on cement mortar) $[NO]_i$: 60-46; RH: 55-50; FR: 85-29	(aggregates on cement mortar) $[NO]_i$: 54-33; RH: 52-40; FR: 78-18	(aggregates on cement mortar) $[NO]_i$: 94-71; RH: 95-81; FR: 91-64	Si et al., 2021
P25 water suspension onto glass	Based on ISO 22197-1:2007		10	*(FR=1.5-11)* 0.1-1	50	*($[NO]_i$=0.1-1)* 1.5-11		$[NO]_i$: 79-5; FR: 79-5		Mikyskova et al., 2022
P25 water suspension onto glass	ISO 22197-1:2007		*(RH=50)* 0.5-50	0.1	*(I=10)* 0.1-95	3		I: 42-62; RH:68-36		Nosek et al., 2023

[a] Regarding the photocatalytic material, in those cases in which the TiO_2 based product is not a constituent part of the sampled material, the substrate on which it is applied is specified.

(b) In relation to the $\chi_{j\ (j=NO,\ NO_x)}$ and S (%) determined in fixed conditions, if applicable, the comparison between different types of photoactive product, substrate or type of reactor used is shown; data range is associated to results obtained for different samples; operation conditions are also given, in parentheses and italics.

(*) Test carried out under following specified conditions: I=10 Wm^{-2}, $[NO]_i$=1 ppm_v, RH=50% and FR=3 $Lmin^{-1}$.

(**) Test carried out under fixed conditions chosen by the author, defined in parentheses and italics.

(1) NO and NO_x removal expressed as uptake, γ (10^{-4}).

(c) Concerning the system parameters, range of operating values for the target variable under test (I, $[NO]_i$, RH and FR) are given; setting for the rest of variables is also specified (in parentheses and italics

(d) The dependence on system parameters (I, $[NO]_i$, RH and FR) of χ_{NO} (%), χ_{NO_x} (%) and S (%) is displayed. For every parameter, values range is given.

Table S3. Photocatalytic NO and NO2 surface deposition velocities published for different photoactive materials.

First order kinetic approximation	Material	Flow-type reactor	[(a)] Test conditions	$V_{ph,NO}$ (10^{-3} m s^{-1})	[(a)] Test conditions	V_{ph,NO_2} (10^{-3} m s^{-1})	Reference
Classical	TiO_2-mortar onto fiber cement	Based on ISO 22197-1:2007	I=8 $[NO]_i$=0.1 RH=40 FR=ND	3.8	I=8 $[NO_2]_i$=0.1 RH=40 FR=ND	2.9	Gallus et al., 2015
Classical	TiO_2-polymeric paint/ TiO_2-cementitious coat/TiO_2-transparent dispersion onto concrete blocks	Based on ISO 22197-1:2007	I=4 $[NO]_i$=1 RH=50 FR=3	4.2/2.2/3.2			Boonen and Beeldens, 2014
LHM	P25 briquettes	Based on ISO 22197-1:2007	I=10 $[NO]_i$=0.04-1.4 RH=50 FR=3	11.8	I=7 $[NO_2]_i$=0.04-1.4 RH=50 FR=3	1.6	Engel et al., 2015
Classical	P25 water suspension onto glass	Based on ISO 22197-1:2007	I=10 $[NO]_i$=0.1-1 RH=50 FR=3	31-0.7	I=10 $[NO_2]_i$=0.1-1 RH=50 FR=1.5-11	30-0.7	Mikyskova et al., 2022
Classical	TiO_2-water suspension onto PVC	Based on ISO 22197-1:2007	I=10 [NO]i=0.05-0.1 RH=50 FR=2.2	23	I=10 $[NO_2]$i=0.05-0.1 RH=50 FR=2.2	17	Villena et al., 2024

(a) UV-A irradiance, I (W m^{-2}); inlet [NO], $[NO]_i$ (ppm_v); relative humidity, RH (%); flow rate, FR (L min^{-1}).

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