N° RP 2200083/01

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Evaluation of the antiviral activity of a PCO (Photocatalytic Oxidation) filter

Aim of the study

The purpose of the study is to determine the antiviral activity of a photocatalytic (PCO) filter provided by the Customer. The provided PCO filter is a ceramic foam (open-foam) coated with a nanostructured and photocatalytic coating based on tungsten trioxide (WO_3).
The system under analysis consists of the photocatalytic filter and visible light LEDs placed at a distance from the filter such as to provide an illuminance of at least 300 lux on it.
The virus is placed on the sample filters and irradiated with at least 300 lux of visible light from the LEDs placed at the proper distance, during all the contact time.

Method

50µL of viral suspension are inoculated on the samples (in triplicate) and the samples are positioned under the visible light LEDs, at the proper distance.
After the indicated contact times of 20 minutes, 1 hour and 4 hours, the suspensions are recovered and the residual activity of the virus is detected (see $TCID_{50}$ method referred to in standard ISO 21702). The activity of the virus is detected on appropriate type of cells, expressing it in terms of $TCID_{50}$ (reference value for the definition of viral concentrations).

System identification	*Photocatalytic (PCO) WO_3 filters subjected to at least 300 lux through visible light LEDs*	
Identification of the viral strain	***SARS-CoV-2_COV2019 ITALY/INMI1***	
Test temperature	*25°C ± 1°C*	
Contact times	*20 minutes*	*3 repetitions*
	1 hour	*3 repetitions*
	4 hours	*3 repetitions*
Incubation temperature	*37°C ± 1°C*	
Permissive host cell line	*VERO E6 C1008 (ATCC CRL-1586)*	

Results

Control test	
Cytotoxicity on permissive host cell line	*No cytotoxicity detected*

Inoculated viral suspension: $10^{7.00}$ $TCID_{50}$/mL

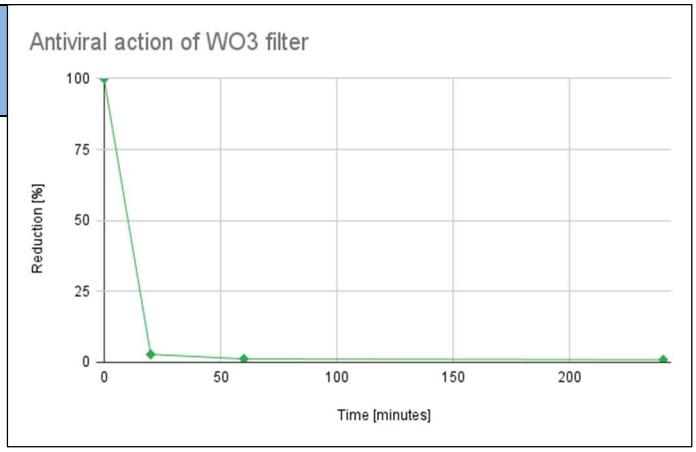
Inoculated viral suspension expressed in Log $TCID_{50}$/mL: *7.00*

Value of Log $TCDI_{50}$/mL indicating the total inactivation of the virus: *1.50*

	Contact time	*Average Log $TCDI_{50}$/mL* (3 repetitions per contact time)
TEST on control sample (no coating and LEDs)	*T0 detection immediately after initial inoculation*	*3.63*
	20 minutes	*3.29*
	1 hour	*2.92*
	4 hours	*1.96*

	Contact time	*Average Log $TCDI_{50}$/mL* (3 repetitions per contact time)	*% reduction vs T0*
TEST on system under analysis	*20 minutes*	*2.08*	*97.18%*
	1 hour	*1.71*	*98.80%*
	4 hours	*1.58*	*99.10%*

Percentage reduction of viral load with respect to initial detection (T0)



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Conclusions

The aim of the study was to determine the antiviral efficacy, against ***SARS-CoV-2_COV2019 ITALY/INMI1***, of the system provided by the Customer, consisting of a photocatalytic (PCO) filter with nanostructured coating based on tungsten trioxide (WO_3), irradiated by visible light LEDs placed at a distance from the filter such as to provide an illuminance of at least 300 lux on it, at room temperature, and after 20 minutes, 1 hour and 4 hours of contact with the viral suspension inoculated on the filter itself.

The viral titer of the suspension recovered at time T0, immediately after the first inoculation on the control sample, represents the initial term of comparison, and corresponds to 3.63 Log $TCDI_{50}$/mL.

The system under analysis demonstrated:
- an average reduction of 1.55 Log of the viral titer (- 97.18%) after an exposure of 20 minutes;
- an average reduction of 1.92 Log of the viral titer (- 98.80%) after an exposure of 1 hour;
- an average reduction of 2.05 Log of the viral titer (- 99.10%) after an exposure of 4 hours.

No toxic substances for the cells used were detected.

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Il Responsabile del Laboratorio
Claudia Modenese

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