

VRS Project #LF02

On behalf of AirDefender International Company Limited., Virology Research Services Limited (Company Number, 11718460) has tested the virucidal activity of Anti-microbial Coating against SARS-CoV-2.

The research was conducted strictly following the protocol for ISO21702:2019. This work was performed in the VRS London labs in May 2021.

Under the conditions tested, the Anti-microbial Coating has a virucidal activity against SARS-CoV-2 at a contact time of 24 h. The experimental protocol and its findings are described in detail in the attached report.

At 24 h, the average recovered titre for the Anti-microbial Coating was 2.15E+01 TCID50/cm² compared to 1.04E+04 TCID50/cm² for the reference control. R (antiviral activity) = 2.69 at 24 h.

The above data indicate that the Anti-microbial Coating inactivates > 99% of virus after 24 h of contact relative to a non-treated control.

Authorized VRS signatory

Mu



Virology Research Services Ltd, Gower St., London, United Kingdom, WC1E 6BT vrs@virologyresearchservices.com, www.virologyresearchservices.com

Testing the virucidal activity of Anti-Microbial Coating against SARS-CoV-2 using ISO21702

A report prepared by Virology Research Services Ltd for

AirDefender International Company Limited Rm 35,7/F, BLK 2, Metro Centre, 21 Lam Hing Street Kowloon Bay, Kowloon, Hong Kong

Project No. LF02 Document No. LF02_ISO21702

Experiment start date: 28th May 2021 Date of report: 1st June 2021





ISO/IEC 17025:2017 Accredited Accreditation #111376

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The virucidal activity of Anti-Microbial Coating against SARS-CoV-2

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Summary

Aim

This study tests the antiviral activity of Anti-Microbial Coating against SARS-CoV-2 at a contact time of 24 hours relative to a non-treated reference control.

Methods

ISO21702 is a standard protocol to quantify the antiviral properties of non-porous surfaces. In this protocol, a pre-determined concentration of virus was dispensed onto test and reference surfaces and incubated at room temperature for 24 hours in a humidified chamber.

Next, the samples were recovered by washing with media (neutraliser), and the amount of infectious virus in each suspension was quantified using a TCID50 assay. For the assay to be valid, the material tested must have no cytotoxic activity on the cells used to quantify the virus, nor interfere with cell sensitivity to infection.

Results

Virucidal activity against SARS-CoV-2 was observed for the treated material relative to the reference control. The R value (antiviral activity) was 2.69.

The test material had no cytotoxic activity towards the cells used to quantify the virus. No cytotoxic activity was detected for the reference control sample. No cytotoxic activity was detected for the media only sample.

Conclusion

Under the conditions tested, Anti-Microbial Coating displays virucidal activity against SARS-CoV-2.

Aim

To test the virucidal activity of Anti-Microbial Coating against SARS-CoV-2 at a contact time of 24 hours relative to a reference control, following ISO21702:2019.

Methods

Assay validity control tests

For the assay to be valid, the material tested must have no cytotoxic activity on the cells used to quantify the virus, nor interfere with cell sensitivity to infection. The two tests of these criteria are described below.

Cytotoxicity control: Is the tested material cytotoxic to the assay's host cells?

Assay media is added to treated material and reference control for 5 min, before being collected and added onto monolayers of cells seeded into the wells of a 96-well plate. Cells are then cultured, and after 3 days a viability assay (crystal violet staining) is used to determine cell viability. The test is carried out in triplicate for both the treated material and nontreated reference control.

Media that has been in contact with neither the treated material nor reference control is included as a reference. For the test to be valid, no cytotoxic effect should be observed compared to the media.

Sensitivity control: Do the tested materials affect the assay cells' sensitivity to the virus?

Assay media is added to treated material and reference control for 5 min, before being collected in tubes. Next, to test whether exposing the media to the materials affects the cells' sensitivity to infection, 0.5×10^{6} infectious units (IU) of virus are added into each tube. After a 30-min incubation at room temperature, the amount of infectious virus in each sample is quantified (TCID50 assay). The 50% tissue culture infectious dose (TCID50) is the end-point virus dilution where 50% of the infected test cells die.

The tests are carried out in triplicate on treated and non-treated material. Media that has not been in contact with either material is also incubated with the virus.

When there is no cytotoxicity and the materials do not interfer with the host cell's sensitivity to infection, the assay is considered to meet the requirements for ISO 21702 and can be used to establish the antiviral activity of the test material.

Antiviral test procedure

Treated and non-treated materials were placed in individual discs in triplicate. A liquid volume (200 μ l) of an appropriate concentration of virus (1 x 10^7 IU/ml stock of SARS-CoV-2) was added onto each surface and covered with an inert film.

A lid was placed over each disc, which was then incubated for 24 hours at room temperature in a humidified chamber. At the end of the incubation, the film was lifted, and the sample washed with media to recover the virus. The amount of infectious virus recovered from each sample was then quantified by TCID50.

As a further control, virus was added to three pieces of the reference control material and immediately recovered by washing (referred to as the 'virus recovery control' or 'back-titration'). This recovered virus is used to quantify the starting amount of virus.

TCID50 determination

A eight-point, ten-fold serial dilution from the virus-containing wash media was tested in quadruplicate for each sample on African Green Monkey Kidney Epithelial (Vero) cells. After 3 days, a viability crystal violet assay was carried out to determine cell viability across the dilution series. The dilution at which 50% of cells are infected/killed (TCID50) was calculated using a regression analysis.

Quantification of antiviral activity

When the test is deemed valid, the antiviral activity (R) is calculated as follows:

R = Ut-At

where Ut is the average of the common logarithm of the number of infectious units recovered from the untreated test specimens at the end of the incubation time;

and At is the average of the common logarithm of the number of infectious units recovered from the treated test specimens at the end of the incubation time.

An R value of ≥ 1 indicates antiviral activity.

Key test information

This page provides key additional information required when reporting the findings of an ISO 21702:2019 testing protocol:

Specimens

Test sample: Anti-Microbial Coating Reference control: Standard Inert Sample Size, shape, and thickness: 50 × 50 mm squares, < 10 mm thick

Film

Type of polymer: polyethylene Shape and thickness: 40×40 mm, approx. 12.7 μm thick

Virus/cells

Virus strain: SARS-CoV-2 Host cells: African Green Monkey Kidney Epithelial (Vero)

Test inoculum

Volume: 200 µl Virus titre: 1 × 10^7

Contact time

24 hours

Deviations from the standard protocol None

Test laboratory

Virology Research Services Ltd, London



METHODS

1st June 2021



Scheme 1. An outline of the method used to calculate the virucidal activity (R value) of treated samples relative to a non-treated control sample. Note that this scheme is not comprehensive and does not include all the various controls included in the ISO21702 protocol.

Results

Control tests

The control experiments are summarized in the Appendix.

The test material does not display cytotoxicity towards the cells used to host the virus in this experiment. The test material does not interfere with the cells used to host the virus in this experiment.

Antiviral tests

The results of the antiviral test for Anti-Microbial Coating are summarized in Table 1 and Figure 1. The treated material displays virucidal activity against SARS-CoV-2 when using a contact time of 24 hours.

Anti-Microbial Coating displays antiviral activity against SARS-CoV-2. The average recovered titre for the treated material was 2.15E+01 TCID50/cm² compared to the average recovered titre of 1.04E+04 TCID50/cm² for the non-treated reference control.

R (antiviral activity) = 2.69

Table 1. The average infectious units per cm² recovered from the test and reference control materials at a contact time of 24 hours with the virus.

Test Condition	Virus recovery control (TCID50/cm ²)			Antiviral	test (TC	CID50/cm ²)
Test		NA		2.15E+01	±	8.13E+00
Reference	6.29E+05	±	5.21E+05	1.04E+04	±	3.34E+03

Table 2. The average infectious units per cm² recovered from the test and reference control materials at a contact time of 24 hours with the virus.

Test Condition	TCID50 (log10)	R Value	% reduction
Test	1.33	2.60	000/
Reference	4.02	2.69	99%



Figure 1. The mean TDIC50/cm² values for SARS-CoV-2 following a contact time of 24 hours with test and referencecontrol materials. Error bars are standard error of the mean.

Conclusion

Based on the findings reported here and following ISO 21702, the treated material displays virucidal activity against SARS-CoV-2 after a contact time of 24 hours.

The results of control assays confirm that the tested material is not cytotoxic for the test cells.

Also, the test material does not interfere with the cells' sensitivity to the virus. Thus, the experiment meets the requirements for a valid ISO 21702 test.

Appendix

Control tests

Cytotoxicity

Test Condition	Cytotoxicity
Test	Not cytotoxic
Reference	Not cytotoxic
Media	Not cytotoxic

Cell viability (%) upon incubation with media recovered from reference and treated materials, relative to the fresh media control.

Sensitivity control

Test Condition	Sensitivity	control (1	ſCID50/crẩ)	Sensitivity control (Log10)	Media - material (Log10)
Test	2.75E+05	±	1.13E+05	5.44	0.17
Reference	1.33E+05	±	6.79E+04	5.12	0.48
Media	4.05E+05	±	6.93E+04	5.61	NA

Infectious TCID50/cm² recovered after 30 min incubation with 5 ml of media that has been in contact with the treated or untreated material. The difference between the natural logarithm of the infectivity titre of virus recovered from the media only control and each specimen should be less than or equal to 0.5.

Final page



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附件二(2.1.1)及附件四 新型冠狀病毒 COVID-19

全港唯一能經英國倫敦大學學院之vrs ISO17025實驗室測試確認於乾涸 塗層上能有效殺滅covil 19 (SARS Cov 2)達99%以上

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Next, the samples were recovered by washing with media (neutraliser), and the amount of infectious virus in each suspension was quantified using a TCID50 assay. For the assay to be valid, the material tested must have no cytotoxic activity on the cells used to quantify the virus, nor interfere with cell sensitivity to infection.

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Virus strain: SARS-CoV-2 Host cells: African Green Monkey Kidney Epithelial (Vero)

Test inoculum

Volume: 200 µl Virus titre: 1 × 10^7

Contact time

24 hours

Deviations from the standard protocol None

Test laboratory

Virology Research Services Ltd, London



1st June 2021



Scheme 1. An outline of the method used to calculate the virucidal activity (R value) of treated samples relative to a non-treated control sample. Note that this scheme is not comprehensive and does not include all the various controls included in the ISO21702 protocol.

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Control tests

The control experiments are summarized in the Appendix.

The test material does not display cytotoxicity towards the cells used to host the virus in this experiment. The test material does not interfere with the cells used to host the virus in this experiment.

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The results of the antiviral test for Anti-Microbial Coating are summarized in Table 1 and Figure 1. The treated material displays virucidal activity against SARS-CoV-2 when using a contact time of 24 hours.

Anti-Microbial Coating displays antiviral activity against SARS-CoV-2. The average recovered titre for the treated material was 2.15E+01 TCID50/cm² compared to the average recovered titre of 1.04E+04 TCID50/cm² for the non-treated reference control.

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Table 2. The average infectious units per cm² recovered from the test and reference control materials at a contact time of 24 hours with the virus.

Test Condition	TCID50 (log10)	R Value	% reduction
Test	1.33	2.60	000/
Reference	4.02	2.69	99%



Figure 1. The mean TDIC50/cm² values for SARS-CoV-2 following a contact time of 24 hours with test and referencecontrol materials. Error bars are standard error of the mean.

Conclusion

Based on the findings reported here and following ISO 21702, the treated material displays virucidal activity against SARS-CoV-2 after a contact time of 24 hours.

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Cytotoxicity

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Cell viability (%) upon incubation with media recovered from reference and treated materials, relative to the fresh media control.

Sensitivity control

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Test	2.75E+05	±	1.13E+05	5.44	0.17
Reference	1.33E+05	±	6.79E+04	5.12	0.48
Media	4.05E+05	±	6.93E+04	5.61	NA

Infectious TCID50/cm² recovered after 30 min incubation with 5 ml of media that has been in contact with the treated or untreated material. The difference between the natural logarithm of the infectivity titre of virus recovered from the media only control and each specimen should be less than or equal to 0.5.

Final page



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VRS Project #LF02

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The research was conducted strictly following the protocol for ISO21702:2019. This work was performed in the VRS London labs in May 2021.

Under the conditions tested, the Anti-microbial Coating has a virucidal activity against SARS-CoV-2 at a contact time of 24 h. The experimental protocol and its findings are described in detail in the attached report.

At 24 h, the average recovered titre for the Anti-microbial Coating was 2.15E+01 TCID50/cm² compared to 1.04E+04 TCID50/cm² for the reference control. R (antiviral activity) = 2.69 at 24 h.

The above data indicate that the Anti-microbial Coating inactivates > 99% of virus after 24 h of contact relative to a non-treated control.

Authorized VRS signatory

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2.1.2 冠狀病毒

- Cover sheet / Short test report -

Principal: Airdefender International Company Limited Rm 35,7/F, BLK 2, Metro Centre, 21 Lam Hing Street, Kowloon Bay, Kowloon, Hong Kong

This summary report is based on the test:

 Examination of the virucidal activity of the disinfectant products <u>airDefender</u> against the Transmissible Gastroenteritis Virus of Swine (TGEV; strain: Toyama 36) using the suspension test method following EN 14476:2019 - Screening test S4 at a temperature of T = 20 °C from 24.06.2020

The present summary report consists of the following parts:

1.	Cover sheet [1 page]	\boxtimes
2.	Summary of the test protocol(s) [2 pages]	\boxtimes

Co-applicable documents:

- 1. DIN EN 14476:2019
- 2. Finalised test protocol of the screening test S4 dated 14.07.2020

This summary report has been finalised and released:

Do. Ch. Jul

Date/Signature:

08.08.2020

Dr. Ch. Jursch, Laboratory Manager

Eurovir [®] Hygiene-Labor GmbH	Short Report: Examination of the virucidal activity of a disinfectant
Antivirale Validierung & Rabies	product - using the suspension test method following EN 14476

Information about the testing

Principal:	Airdefender International Company Limited	Test run:	S4 / TGEV-Coronavirus
Product(s):	airDefender	Test date:	24.06.2020
Test system:	TGEV (Toyama 36) + ST75/2 cells	Analysis:	01.07.2020 (7 p.i.)

Test methodology and test parameters

airDefender

Test method:Screening test using the methodology of the EN 14476 (quantitative virucidal suspensions test)Test mixture:1 VT protein load + 1 VT virus suspension + 8 VT neat productProtein load:"clean conditions" (low protein load)Test parameter:T = 20 °C / t = 60 min.

Tested product sample(s)

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1<sup>st</sup> product:
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[Product sample tested as received; Arrival: 29.04.2020; Storage at RT; the product under test was introduced into the experimental test with a preliminary product designation]

Tab. 1: Weight of content

Set	Product (s)	Product conc.	Product conc. in test	Dosage	pH ¹ of Working Sol.
#1	airDefender	undiluted (neat product)	80%	n.a.	not reliably measurable

¹ = pH was constantly drifting. The composition of the product under test was not communicated but this effect is typical for e.g. quarternary ammonium compounts which covers the pores of the electrode.

Test system:

- Transmissible Gastroenteritis Virus of Swine (TGEV); strain: Toyama 36 (Origin: Virusbank der BFA f. Viruskrankheiten der Tiere; Friedrich Löffler-Institut, Insel Riems, Germany)
- ST75/2 cells (foetal testis cells of swine) (Origin: Robert Koch-Institute, Berlin, Germany)

<u>Test results</u>

1. Annotations:

- No changes were made to the test plan
- No abnormalities were observed.

2. Virus titration:

Tab. 2.1: Virus control (Virus titration: by limiting dilution)

Camples	VK-1a	VK-1b	Ø
Samples	Virus control		
Titer/test vol. (Ig ID ₅₀) ¹	5,43 ± 0,35	5,43 ± 0,35	5,43
Average ± CI (95%) ¹		6,43 ± 0,25 / mL	

¹ = calculation of virus titer and its 95% confidential interval was performed according to EN 14476:2019

Tab. 2.2: Cytotoxicity control (Virus titration: by limiting dilution)

Samples	Tox Test	T-1
	data of cytotoxicity test (T1; 18.06.2020)	Cytotoxicity (actual test run)
Titer/test vol. (Ig ID ₅₀) ¹	3,45 / mL	2,75 / mL

¹ = calculation of virus titer and its 95% confidential interval was performed according to EN 14476:2019.

SOP_AV_01-02_Viruzidie	ShortRep_Airdefender Int_TGEV_06.08.2020	Seite 1 von 2

Samples	In-1a	In-1b	Ø
Parameter	Inactivation		
Titer/Test vol. (Ig ID₅₀)	≤ 1,75	≤ 1,75	≤1,75
Average ± K (95%) ¹	≤ 2,75/mL		
Reduction ² (lg ID ₅₀ ± CI [95%])	≥ 3,68 ± 0,25		

Tab. 2.3: Virus inactivation	(Virus titration: by limiting dilution)
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¹ = virus titer and its 95% confidential interval were calculated according to EN 14476:2019

 2 = virus reduction = titer of virus control (Ig ID₅₀) minus titer of sample (Ig ID₅₀)

Tab. 2.4: Virus inactivation	(Virus titration: by La	rge Volume Plating [LVP])
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Complee	In-1	
Samples	Inactivation	
Dilution factor (VF)	1.000	
Sample vol. analysed	10 μL + 10 μL = 20 μL	
Cell cultures inoculated	96	
Virus positive cells	0	
Virus input [mL]	6,43 ± 0,25	
Titer/test vol. (Ig ID₅₀)	≤ 2,33 / mL	
Reduction ² (lg ID ₅₀ ± CI [95%])	≥4,10 ± 0,25	

¹ = virus titer and its 95% confidential interval were calculated according to EN 14476:2019

 2 = virus reduction = titer of virus control (lg ID₅₀) minus titer of sample (lg ID₅₀)

Conclusions:

- When the product *airDefender* (neat product) was introduced into test under "clean conditions" no residual test virus was detected above the cytotoxicity level (lg TD₅₀ = 2,75/mL; cf. Tab. 2.3).
- Using the LVP-titration method also no residual virus was detected with the 1.000-fold diluted test sample. With the Poisson-formula applied the (virtual) virus titer amounted to lg $ID_{50} \le 2,33/mL$, corresponding to a virus reduction of RF $\ge 4,10 \pm 0,25$ (cf. Tab. 2.4).
- With the present screening test the TGEV-Coronavirus (cf. Test system) was used as the test virus. This virus is a member of the virus family *coronaviridae* to which SARS-CoV and SARS-CoV-2 also belong. Based on the data as obtained a basic virucidal activity against the coronaviruses was demonstrated.
- With respect to product validation a complete validation test according to EN 14476 vs. coronavirus (virus claim: specifically virucidal active against coronaviruses) can be striven.
- In my opinion, however, a complete validation test according to EN 14476 vs. Vacciniavirus is more advantageous. With a successful testing vs. Vacciniavirus a virucidal activity against all enveloped virus can be claimed. This virucidal claim includes (for example) HIV, HBV, HCV, the influenza viruses, the corona viruses [incl. SARS-CoV-2] and others.

2.2 天花

- Cover sheet / Short test report -

Principal: Airdefender International Company Limited Rm 35,7/F, BLK 2, Metro Centre, 21 Lam Hing Street, Kowloon Bay, Kowloon, Hong Kong

This summary report is based on the test:

 Examination of the virucidal activity of the disinfectant product <u>airDefender</u> against <u>Vacciniavirus</u> (<u>Elstree</u>) using the suspension test method following EN 14476:2019 - Screening test S4 at a temperature of T = 20 °C from 24.06.2020

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1.	Cover sheet [1 page]	\boxtimes
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Eurovir [®] Hygiene-Labor GmbH	Short Report: Examination of the virucidal activity of a disinfectant
Antivirale Validierung & Rabies	product - using the suspension test method following EN 14476

Information about the testing

Test system.	vaccillavilus (<i>Eistree</i>) + vero-76 cells	Anulysis.	08.07.2020 (14 p.1.)
Tast system:	Vacciniavirus (Eletron) + Varo 76 colle	Analysis	00 07 2020 (14 m ;)
Product(s):	airDefender	Test date:	24.06.2020
Principal:	Airdefender International Company Limited	Test run:	S4 / Vacciniavirus

Test methodology and test parameters

airDefender

Test method:Screening test using the methodology of the EN 14476 (quantitative virucidal suspensions test)Test mixture:1 VT protein load + 1 VT virus suspension + 8 VT neat productProtein load:"clean conditions" (low protein load)Test parameter:T = 20 °C / t = 60 min.

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Test system:

- Vacciniavirus (strain: Elstree)
 (Origin: Institute of virology and antiviral therapy of the University of Jena, Germany)
- Vero-76 cells (Origin: Institute of virology and antiviral therapy of the University of Jena, Germany)

<u>Test results</u>

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Samples	Virus control			
Titer/test vol. (Ig ID ₅₀) ¹	5,95 ± 0,49	5,95 ± 0,57	5,95	
Average ± CI (95%) ¹		6,95 ± 0,39 / mL		

¹ = calculation of virus titer and its 95% confidential interval was performed according to EN 14476:2019

Tab. 2.2: Cytotoxicity control (Virus titration: by limiting dilution)

Samplas	Tox Test	T-1	
Samples	data of cytotoxicity test (T1; 18.06.2020)	Cytotoxicity (actual test run)	
Titer/test vol. (Ig ID ₅₀) ¹	3,45 / mL	3,45 / mL	

¹ = calculation of virus titer and its 95% confidential interval was performed according to EN 14476:2019.

SOP	AV 0	1-02	Viruzidie
_		_	

Complex	In-1a	In-1b	Ø		
Samples	Inactivation: neat / 60 min. / CC				
Titer/test vol. (Ig ID₅₀)	≤ 2,45	≤ 2,45	≤2,45		
Average ± CI (95%) ¹	≤ 3,45 / mL				
Reduction ² (lg ID ₅₀ ± Cl [95%])		≥ 3,50 ± 0,39			

Tab. 2.3: Virus inactivation	(Virus titration: by limiting dilution)
------------------------------	---

¹ = virus titer and its 95% confidental interval were calculated according to EN 14476:2019

 2 = virus reduction = titer of virus control (lg ID_{50}) minus titer of sample (lg ID_{50})

Tab. 2.4: Virus inactivation (Virus titration: by Large Volume Plating [LVP])

Complex	In-1	
Samples	Inactivation: neat / 60 min. / CC	
Dilution factor (VF)	1.000	
Sample vol. analysed	10 μL + 10 μL = 20 μL	
Cell cultures inoculated	96	
Virus positive cells	0	
Virus input [mL]	6,95 ± 0,39	
Titer/test vol. (Ig ID₅₀)	≤ 2,33 / mL	
Reduction ² (lg ID ₅₀ ± CI [95%])	≥4,62 ± 0,39	

¹ = virus titer and its 95% confidential interval were calculated according to EN 14476:2019

 2 = virus reduction = titer of virus control (lg ID₅₀) minus titer of sample (lg ID₅₀)

Conclusions:

- When the product *airDefender* (neat product) was introduced into test under "clean conditions" no residual test virus was detected above the cytotoxicity level (lg TD₅₀ = 3,45/mL; cf. Tab. 2.3).
- Using the LVP-titration method also no residual virus was detected with the 1.000-fold diluted test sample. With the Poisson-formula applied the (virtual) virus titer amounted to lg $ID_{50} \le 2,33/mL$, corresponding to a virus reduction of RF $\ge 4,62 \pm 0,34$ (cf. Tab. 2.4).
- Based on the present data as obtained in the corresponding screening test and to my opinion a complete validation test according to EN 14476 vs. Vacciniavirus (virucidal claim: "virucidal active against enveloped viruses") can be striven with the tested product. With this virucidal claim a virucidal activity against all enveloped virus is assumed (e.g. HIV, HBV, HCV, the influenza viruses, the corona viruses [incl. SARS-CoV-2] and others).
- From the data obtained it cannot be concluded whether or not a virucidal activity against the non-enveloped viruses is also given (virus claim: "limited virucidal PLUS" or "virucidal").
| 2.3 | 甲型
H1N | し
流風
J1 | 贰 | 試験 | 鑑云 | Èį | 証明 | 書 | DTK20- 00415 |
|-----|-----------|---------------|--------------|-------------------|-----------------|----------------|----------------|-------------|--|
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| | 依東 | 頁 者 | airDef | ender Interna | tional Com | pany l | Limted 肤 | <u>t</u> | 2020 年 5 月 18 日 |
| | 品番(| 品名) | | 下 | 記参照 | | | | 一般財団法人 |
| | 数 | 量 | 12 | 1 | 点 | | | | ニッセンケン品質評価センター |
| | | 20204 | ∓4月30 | 0日に提出され | た試料につ | いて試 | 験の結果、 | 下記の通 | りであることを証明します。 東京事美所 |
| Γ | 0 | 試験 | 式料 | (1) Me | tamaterial Co | ated GI | lass Sample | | |
| | Ι. | 試 | 験項目 | 抗ウイル | ス性試験 | | | | |
| | Π. | 試 | 験方法 | ISO 2170 | 2:2019 Measu | uremen | t of antiviral | activity on | plastics and other non-porous surfaces |
| | ш. | 測 | 定方法 | プラーク | 則定法 | | | | |
| | IV. | 試 | 験ウイノ | レス 1. Influer | nza A virus ; A | A/PR/8 | 3/34 (H1N1) | ATCC VR- | 1469 |
| | v. | 試 | 験結果 | | | | | | |
| | | ∇ | Influenz | za A virus ; A/PI | R/8/34 (H1N1 |) ATC | C VR-1469 | | |
| | | <訪 | は験ウイ | ルス液> | | _ | | | |
| | | 114 | 感染 | 価 (PFU/mL) | 2.10 × 10 | o ⁷ | | | |
| | | | 接 | :種量 (mL) | 0.4 | | | | |
| | | (文) | 打照試 料 | t> | | | | | |
| | | | | 区分 | | 感 | 染価対数値 | | |
| | | | | | 接種直後 | Uo | 5.64 | | |
| | | 112 | ポリエ | チレンフィルム | 1hr反応後 | Ut | 5.64 | | |
| | | 114 | | | 24hr反応後 | Ut | 5.10 | | |
| | | <訪 | 試験試料 | ↓ > | | _ | | | |
| | | 14 | | 区分 | | 感染価対数値 | | 抗ウイル | ~ス活性値 |
| | | 133 | | | | | | R = l | Jt - At |
| 40 | | 12 | (1) | 原品 | 1hr反応後 | At | 5.06 | 1 | 0.6 |
| 9 | | 699 | | | 24hr反応後 | At | 0.80 | | 4.3 |
| 4 | | | * 試駒 | €結果はDTK19- | 07040(2020年 | =4月21 | 日発行)より | 松吉ピレ/こ。 | |
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試験は提出試料による





Nissenken Quality Evaluation Center

2-16-11, KURAMAE, TAITO-KU, TOKYO, JAPAN TELEPHONE : (03) 5809 - 1360

CERTIFICATE NUMBER	: DTK20-00415-1	(1/2)
REQUEST DATE	: April 30, 2020	
ISSUE DATE	: May 18, 2020	

REQUESTER : airDefender International Company Limted

(1)

:

CERTIFICATE OF TESTING

Regarding the material submitted by the client described above, we hereby certify that our test results were as follows:

SA	M	PL	ES
~~~			

Metamaterial Coated Glass Sample

TESTING ITEM	:	Testing of antiviral activity
TESTING METHOD	:	ISO21702:2019 Measurement of antiviral activity on plastics and other non-porous surfaces
		Measurement method : Plaque assay
TESTING VIRUS	:	1 . Influenza A virus ; A/PR/8/34 (H1N1) ATCC VR-1469

Nissenken Quality Evaluation Center TOKYO Laboratory

SIGNATURE

SIGNATURE - Maralu

CHIEF OF LABORATORY

PERSON IN CHARGE

Test is according to submitted samples

# TEST RESULT

<b>REQUESTER:</b>	airDefender	International	Company	Limted
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Measurment Result

[Virus suspension]

Viru	S	Influenza A virus ; A/PR/8/34 (H1N1) ATCC VR-1469				
Infectivity titre	(PFU/mL)	2.10	×	10 7		

[Final test]

control specimen

Virus	1	Common logarithm		
		immediately after inoculation	U ₀	5.64
1	Control	after 1h contact	Ut	5.64
		after 24h contact	Ut	5.10

control specimen: Polyethylene film

test specimen

Virus	Spe	Common logarithm		Antiviral activity value R = Ut - At	
1		after 1h contact	At	5.06	0.6
	(1)	after 24h contact	At	0.80	4.3

* Transcribed from DTK19-07040 (Issued on April 21th, 2019)



# 2.4 黑麴黴 Aspergillus niger

Test Report	Report No: ASH17-024697-02	Date: Jun 29 2017
Client name:	TitanPE Technologies, Inc.	
Client address:	BD11, NO.415, GULANG ROAD, SHANGHAI	
Sample name:	Coating Suisse AGSOL5000	
Sample Batch No.:	R0613	
Product Date:	/	
Manufacturer:	TitanPE Technologies, Inc.	

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

SGS Sample No.:	ASH17-024697.001
Date of sample received:	Jun 13 2017
Testing period:	Jun 13 2017 ~ Jun 29 2017

#### TEST(S) REQUESTED:

Selected test(s) as requested by applicant: Antifungal activity test

#### TEST METHOD(S)/TEST RESULT(S):

Please refer to the next page(s)

#### CONCLUSION(S):

Test Fungal (Strain number)	Antifungal activity value A	Criterion of antifungal efficacy
Aspergillus niger ATCC 6275	>4.7	Fungistatic with full effect

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Report No: ASH17-024697-02

Date: Jun 29 2017

# TEST METHOD(S):

ISO 13629-2:2014 Textiles-Determination of antifungal activity of textile products-Part 2: Plate count method

# TEST ORGANISM(S):

Aspergillus niger ATCC 6275

# TEST RESULT(S):

Test Fungal	Aspergillus niger
(Strain number)	ATCC 6275
Concentration of spore suspension	2.3x10 ⁵
The growth value on the control fabric	+1.5
$(F=IgC_{t}-IgC_{0})$	$(IgC_{t:} + 6.1, IgC_{0:} + 4.6)$
The growth value on the antifungal-treated samples	< -3.2
$(G=IgT_t-IgT_0)$	(IgT _{t:} <+ 1.3 , IgT _{0:} <+ 4.5)
The antifungal activity value	- 4 7
(A=F-G)	>4.7
Inoculation method	Absorption method
Sterilization method	Autoclave(121°C, 20min)

Remark:

Control fabtic:100% cotton fabric without fluorescent brighteners or other finish ,provided by SGS lab.  $C_t$  is the arithmetic average of the number of fungi obtained from three test samples of control fabric after (48±2)h incubation

 $C_0$  is the arithmetic average of the number of fungi obtained from three test samples of control fabric immediately after inoculation.

 $T_t$  is the arithmetic average of the number of fungi obtained from three antifungal-treated test samples after (48±2)h incubation

 $T_0$  is the arithmetic average number of the number of fungi obtained from three antifungal-treated test samples immediately after inoculation.

F: is the growth value on the control fabric

G: is the growth value on the antifungal-treated samples

A: is the antifungal activity value

Example of efficacy of antifungal property

Item	A value	Explanation
Criterion of antifungal efficacy	A<1	No effect
by antifungal activity value A in	2>A>1	Fungistatic with small effect
Formula	3>A>2	Fungistatic with medium effect
	A>3	Fungistatic with full effect
	Tt=0	Fungicidal effect

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Report No: ASH17-024697-02

Date: Jun 29 2017

SAMPLE DESCRIPTION: sample in bag



*** End ***

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### Test Report No: SHFDO100912172FDS1

Date: Sep 14 2010

Client name: TitanPE Technologies, Inc. Client address: BD 7, No.198, Changhe Road, Shanghai, PRC

#### The following sample(s) was/were submitted by/ on behalf of the client as:

Sample name: Photocatalytic Textile Batch No.: A1663 Manufacturer: TitanPE Technologies, Inc. SGS Reference No.: GZFDO100903654FD SGS Job no.: SHFDO100912172FD Date of receipt: Sep 01 2010 Testing period: Sep 01 2010 ~ Sep 09 2010

#### TEST(S) REQUESTED:

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

#### **TEST METHOD:**

JIS L 1902:2008 The Method of antibacterial test and assessment of antibacterial effectiveness for textiles , Chapter 10: Quantitative test (Absorption method)

#### TEST ORGANISMS:

Escherichia.coli ATCC 8739

#### CONCLUSION:

**Pass:** The Log value of bacteriostatic for *Escherichia.coli* is > 6.6, complies with JIS L 1902:2008 Specification for antibacterial finish (The bacteriostatic activity value shall be  $\geq$  2.0 for antibacterial finish).

Signed for and on behalf of SGS

Amy Gan

Authorized Signature

Page 1 of 2

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# No: SHFDO100912172FDS1

### Date: Sep 14 2010

TEST RESULT(S):

**Test Report** 

Name of test bacteria (Strain number)	Escherichia.coli (ATCC 8739)
Concentration of inoculum (CFU/mL)	1.7×10 ⁵
The growth value on the control sample F ( $F=M_b-M_a$ )	+ 3.8 (M _b :+ 8.1 , M _a :+ 4.3)
The growth value on the antimicrobial-treated sample $(\rm M_{c^{-}}~\rm M_{d})$	< - 2.8 (M _c :< + 1.3 _, M _d :+ 4.1)
Bacteriostatic activity value $S = (M_b - M_a) - (M_c - M_d)$	> 6.6
Bactericidal activity value $L = M_a - M_c$	> 3.0
Incubation time (h)	18
Measuring method	Plate count method

#### **REMARK:**

 $M_a$ : The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 0h.

 $M_b$ : The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 18h.

 $M_c$ : The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 18h.

 $M_d$ : The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 0h

The control sample is standard cotton cloth specified by JISL 1902:2008, provided by SGS lab.

#### SAMPLE DESCRIPTION: White cloth



*** End of Report***

# Page 2 of 2

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Test Report	Report No: ASH18-048042-01	Issue Date: Oct 16 2018
Client name: Client address: Sample name: Sample Batch No.: Product Date:	TitanPE Technologies,Inc. BD11,NO.415,GULANG ROAD, SHANGH, AG425K ET001 / TitesPE Technologies Inc.	AI, 200331
Manufacturer.		

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

SGS Sample No.:	ASH18-048042.001
Date of sample received:	Sep 25 2018
Testing period:	Sep 25 2018 ~ Oct 16 2018

#### **TEST(S) REQUESTED:**

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

# TEST METHOD(S)/ TEST RESULT(S):

Please refer to the next page(s)

#### CONCLUSION(S):

Name of test bacteria (Strain number)	Antibacterial value:A	Efficacy of antibacterial property	Comment
Klebsiella pneumoniae (ATCC 4352)	>6.3	Antibacterial value 2≤A<3, the efficacy of antibacterial property of the test fabric can be considered significant; Antibacterial activity A≥3, the efficacy of antibacterial property of the test fabric can be considered strong	Pass, the efficacy of antibacterial property of the test fabric can be considered strong

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Report No: ASH18-048042-01

Issue Date: Oct 16 2018

# **TEST METHOD:**

ISO 20743:2013 Textiles-Determination of antibacterial activity of textile products: 8.1 Absorption method

#### **TEST ORGANISMS:**

Klebsiella pneumoniae ATCC 4352

Name of test bacteria (Strain number)	Klebsiella pneumoniae (ATCC 4352)	
Concentration of inoculum (CFU/mL)	2.9x10 ⁵	
Difference of extremes for the three	0h	24h
(condition: less than 1)	<0.1	<0.1
Difference of extremes for the three antibacterial testing specimens(lg) (condition: less than 2)	0h	24h
	<0.1	<0.1
The growth value on the control sample $F(F=lgC_t-lgC_0)$	3.0 (IgC _t +7.7 IgC ₀ +4.7)	
The growth value on the antimicrobial- treated sample G (G =lgTt-lgT0)*		
Antibacterial activity value (A=F-G)	>6	.3
Measuring method	Plate count method	
Sterilization method	Autoclave	
Incubation time	24h	

**REMARK:** The control sample is 100% cotton fabric, provided by SGS lab. * In case of  $C_0 > T_0$ , substitute  $C_0$  for  $T_0$ .

# SAMPLE DESCRIPTION:



*** End ***

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#### No: SHFDO120810413FD

Date: Sep 18 2012

Client name: Titanpe Technologies. Inc Client address: 1 Floor BD.7, ChangHe Road No.198.

The following sample(s) was/were submitted by/ on behalf of the client as (except SGS reference No. & SGS job No. & Date of receipt & Testing period):

Sample name: Sample Batch No./Date: / Manufacturer: / SGS job No.: SHFDO120810413FD Date of receipt: Aug 02 2012 Testing period: Aug 02 2012 ~ Sep 18 2012

#### **TEST(S) REQUESTED:**

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

#### **TEST METHOD:**

JIS L 1902:2008 The Method of antibacterial test and assessment of antibacterial effectiveness for textiles, Chapter 10: Quantitative test (Absorption method)

#### **TEST RESULT(S):**

Please refer to next page

#### **CONCLUSION:**

Pass: The Log value of bacteriostatic for * Legionella pneumophila is > 5.2, comply with JIS L 1902:2008 Specification for antibacterial finish (The bacteriostatic activity value shall be ≥ 2.0 for antibacterial finish).

*According to client's requirement, judge with reference to JIS L 1902:2008



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#### No: SHFDO120810413FD

Date: Sep 18 2012

#### **TEST ORGANISMS:**

Legionella pneumophila ATCC33152

#### TEST RESULT(S):

Name of test bacteria (Strain number)	<i>Legionella pneumophila</i> (ATCC33152)
Concentration of inoculum (CFU/mL)	2.3×10 ⁵
The growth value on the control sample F (F= $M_b$ - $M_a$ )	+2.1 (M _b :+6.5 M _a :+4.4)
The growth value on the antimicrobial-treated sample ( $\rm M_{c}\text{-}$ $\rm M_{d})$	< -3.1 (M _c : < +1.3 , M _d :+4.4)
Bacteriostatic activity value S= (M _b -M _a )- (M _c -M _d )	> 5.2
Bactericidal activity value L= M _a -M _c	> 3.1
Incubation time (h)	18
Measuring method	Plate count method

# **REMARK:**

M_a: The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 0h.

M_b: The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 18h.

- M_c: The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 18h.
- M_d: The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 0h
- CFU: Colony forming unit

The control sample is standard cotton cloth specified by JISL 1902:2008, provided by SGS lab.

# SAMPLE DESCRIPTION: White cloth



*** End of Report***

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Test Report	Report No: ASH14-025972-01	Date: Sep 02 2014
Client name:	TITANPE TECHNOLOGIES, INC.	
Client address:	BD 7, NO. 198, CHANGHE ROAD, SHAN	IGHAI, PRC
Sample name:	AG425K Coated Sample	
Sample Batch No.:	/	
Product Date:	/	
Manufacturer:	TITANPE TECHNOLOGIES, INC.	

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SGS Sample No.:	ASH14-025972.001
Date of sample received:	Aug 22 2014
Testing period:	Aug 22 2014 ~ Sep 02 2014

#### TEST(S) REQUESTED:

Selected test(s) as requested by applicant Antibacterial Assessment for the submitted sample

#### **TEST METHOD:**

JIS L 1902:2008 The Method of antibacterial test and assessment of antibacterial effectiveness for textiles, Chapter 10: Quantitative test (Absorption method)

#### TEST RESULT(S):

Please refer to the next page(s)

#### **CONCLUSION:**

**Pass:** The Log value of bacteriostatic for *Listeria monocytogenes* is 3.8, complies with JIS L 1902:2008 Specification for antibacterial finish (The bacteriostatic activity value shall be  $\geq$  2.0 for antibacterial finish). (According to client's requirement, judge with reference to JIS L 1902:2008)



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# Report No: ASH14-025972-01

Date: Sep 02 2014

# TEST ORGANISMS:

Listeria monocytogenes 54001

#### TEST RESULT(S):

Name of test bacteria (Strain number)	<i>Listeria monocytogenes</i> (54001)
Concentration of inoculum (CFU/mL)	2.7x10 ⁵
The growth value on the control sample F (F= $M_b$ - $M_a$ )	+2.2 (M _b :+6.7 , M _a :+4.5)
The growth value on the antimicrobial-treated sample $(M_c\text{-}M_d)$	-1.6 (M _c :+2.9 , M _d :+4.5)
Bacteriostatic activity value S= (M _b -M _a )- (M _c -M _d )	3.8
Bactericidal activity value L= M _a -M _c	1.6
Incubation time (h)	18
Measuring method	Plate count method

#### **REMARK:**

 $M_a$ : The average of log value of bacteria obtained from the three control samples that inoculated the test germ after 0h.

 $M_b$ : The average of log value of bacteria obtained from the three control samples that inoculated the test germ after 18h.

- M_c: The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 18h.
- $M_d$ : The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 0h

The control sample is standard cotton cloth specified by JISL 1902:2008, provided by SGS lab.

# SAMPLE DESCRIPTION: 1 bag, ca.50g/bag, sample in bag



*** End of Report***

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# 2.9 耐甲氧西林金黃色葡萄球菌 Methicillin Resistant Staphylococcus aureus

#### **Test Report**

#### No: SHFDO100912172FD1

Date: Sep 21 2010

Client name: TitanPE Technologies, Inc. Client address: BD 7, No.198, Changhe Road, Shanghai, PRC

#### The following sample(s) was/were submitted by/ on behalf of the client as:

Sample name: Photocatalytic Textile Batch No.: A1663 Manufacturer: TitanPE Technologies, Inc. SGS Reference No.: GZFDO100903654FD.2 SGS Job no.: SHFDO100912172FD Date of receipt: Sep 01 2010 Testing period: Sep 10 2010 ~ Sep 21 2010

#### **TEST(S) REQUESTED:**

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

#### **TEST METHOD:**

JIS L 1902:2008 The Method of antibacterial test and assessment of antibacterial effectiveness for textiles, Chapter 10: Quantitative test (Absorption method)

#### **TEST ORGANISMS:**

Methicillin Resistant Staphylococcus aureus ATCC 33591

#### **CONCLUSION:**

**Pass:** The Log value of bacteriostatic for *Methicillin Resistant Staphylococcus aureus* is > 2.7, complies with JIS L 1902:2008 Specification for antibacterial finish (The bacteriostatic activity value shall be >2.0 for antibacterial finish) .

Signed for and on behalf of SGS

Authorized Signature

Page 1 of 2

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## No: SHFDO100912172FD1

# Date: Sep 21 2010

TEST RESULT(S):

**Test Report** 

Name of test bacteria (Strain number)	Methicillin Resistant Staphylococcus aureus (ATCC 33591)
Concentration of inoculum (CFU/mL)	1.1×10 ⁵
The growth value on the control sample F (F= $M_b$ - $M_a$ )	+ 2.1 (M _b :+ 6.4 , M _a :+ 4.3)
The growth value on the antimicrobial-treated sample $(\rm M_{c}\mathchar`-M_{d})$	- 0.6 (M _c :+ 3.4 , M _d :+ 4.0)
Bacteriostatic activity value $S = (M_b - M_a) - (M_c - M_d)$	2.7
Bactericidal activity value $L = M_a - M_c$	0.9
Incubation time (h)	18
Measuring method	Plate count method

#### **REMARK:**

 $M_a$ : The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 0h.

 $M_b$ : The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 18h.

 $M_c$ : The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 18h.

 $M_d$ : The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 0h

The control sample is standard cotton cloth specified by JISL 1902:2008, provided by SGS lab.

#### SAMPLE DESCRIPTION: White cloth



*** End of Report***

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# 2.10 鼠傷寒沙門氏菌 Salmonella typhimurium

Test Report	Report No: ASH15-026060-01	Date: Jul 30 2015
Client name:	TitanPE Technologies, Inc.	
Client address:	BD7, NO.198, CHANGHE ROAD, SHANGHAI	
Sample name:	AG-Series	
Sample Batch No .:	/	
Product Date:	/	
Manufacturer:	TIPE	

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SGS Sample No.:	ASH15-026060.001
Date of sample received:	Jul 21 2015
Testing period:	Jul 21 2015 ~ Jul 30 2015

#### **TEST(S) REQUESTED:**

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

**TEST METHOD(S):** Please refer to the next page(s)

#### TEST RESULT(S):

Please refer to the next page(s)

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Report No: ASH15-026060-01

Date: Jul 30 2015

# **TEST METHOD:**

ISO 20743:2013 Textiles-Determination of antibacterial activity of textile products: 8.1 Absorption method

# **TEST ORGANISMS:**

Salmonella typhimurium AS 1.1194

# **TEST RESULT(S):**

Name of test bacteria (Strain number)	Salmonella typhimurium (AS 1.1194)	
Concentration of inoculum (CFU/mL)	1.3×10 ⁵	
Difference of extremes for the three control	0h	24h
(condition: less than 1)	< 0.1	< 0.1
Difference of extremes for the three antibacterial	0h	24h
testing specimens(lg) (condition: less than 2)	< 0.1	< 0.1
The growth value on the control sample F (F=lgC _t - $lgC_0$ )	+2.9 (lgC _t +7.1 lgC ₀ +4.2)	
The growth value on the antimicrobial-treated sample G (G =lgT _t -lgT ₀ )*	<-2.9 (lgT _{t:} <+1.3 , lgT _{0:} <+2.3)	
Antibacterial activity value (A=F-G)	> 5.8	
Measuring method	Plate count method	
Sterilization method	Autoclave(121°C,15min)	
Incubation time	24h	

**REMARK:** The control sample is 100% cotton fabric, provided by SGS lab. * In case of  $C_0 > T_0$ , substitute  $C_0$  for  $T_0$ .

# SAMPLE DESCRIPTION: Beige fabric



*** End ***

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# 2.11 溶血性鏈球菌 Alpha Hemolytic Streptococcus

Test Report	Report No:	ASH19-000911-02	Issue Date: Jan 16 2019
Client name: Client address: Sample name: Sample Batch No.: Product Date: Manufacturer:	TitanPE Techr BD11,NO.415 AG420 08S43S-ET / TitanPE Techr	nologies,Inc. ,GULANG ROAD, SHAI nologies,Inc.	NGHAI, 200331

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SGS Sample No.:	ASH19-000911.001
Date of sample received:	Jan 07 2019
Testing period:	Jan 07 2019 ~ Jan 15 2019

#### TEST(S) REQUESTED:

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

**TEST METHOD(S):** Please refer to the next page(s)

# TEST RESULT(S):

Please refer to the next page(s)

This Test Report supersedes the Test Report No. ASH19-000911-01 dated Jan 16 2019 issued by SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. Original test report will be invalid from today.

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Report No: ASH19-000911-02

Issue Date: Jan 16 2019

CONCLUSION(S):

Name of test bacteria (Strain number)	Antibacterial value:A	Efficacy of antibacterial property	Comment
Alpha Hemolytic Streptococcus (CMCC 32213)	>6.2	Antibacterial value 2≤A<3, the efficacy of antibacterial property of the test fabric can be considered significant; Antibacterial activity A≥3, the efficacy of antibacterial property of the test fabric can be considered strong	Pass, the efficacy of antibacterial property of the test fabric can be considered strong

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Report No: ASH19-000911-02

Issue Date: Jan 16 2019

# **TEST METHOD:**

ISO 20743:2013 Textiles-Determination of antibacterial activity of textile products: 8.1 Absorption method

# TEST ORGANISMS:

CMCC (B) 32213

#### TEST RESULT(S):

Name of test bacteria (Strain number)	Alpha Hemolytic Streptococcus (CMCC 32213)		
Concentration of inoculum (CFU/mL)	1.2>	(10 ⁵	
Difference of extremes for the three	0h	24h	
control specimens(Ig) (condition: less than 1)	<0.1	<0.1	
Difference of extremes for the three	0h	24h	
(condition: less than 2)	<0.1	<0.1	
The growth value on the control sample F (F=lgCt-lgC0)	+3.2 (lgC _t + 7.5 lgC ₀ + 4.3)		
The growth value on the antimicrobial- treated sample G (G =lgT _t -lgT ₀ )*	<-3.0 (IgTt:<+1.3,IgT0:+4.3) >6.2 Plate count method Autoclave 24h		
Antibacterial activity value (A=F-G)			
Measuring method			
Sterilization method			
Incubation time			

**REMARK:** The control sample is 100% cotton fabric, provided by SGS lab. * In case of  $C_0 > T_0$ , substitute  $C_0$  for  $T_0$ .

# SAMPLE DESCRIPTION:



*** End ***

# SGS-CSTC Standards Technical Services (Shanghai) Co.,Ltd. Page 3 of 3

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airDefender International Company Limited Unit 35, 7/F, Block 2, Metro Centre,21 Lam Hing Street, Kowloon Bay Tel: 3611 8420 Fax: 3188 0246 www.airdefender.com



# Content

# **1. Fact Sheet**

# 1.1 Safety

- 1.1.1 Oral Toxicity test
- 1.1.2 Skin Irritation test
- 1.1.3 Eye irritation test
- 1.1.4 Cytotoxicity test
- 1.1.5 Inhalation test

# 1.2 365 Days simulation

- 1.2.1 Test of antimicrobial activity
- 1.2.2 Duration checked with 2000 rubbing test
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- 1.3.11 Anti Alpha Hemolytic Streptococcus



# 1.1 Safety

- 1.1.1 Oral Toxicity test
- 1.1.2 Skin Irritation test
- **1.1.3** Eye irritation test
- 1.1.4 Cytotoxicity test
- 1.1.5 Inhalation test

	Name	STANDARD	Test Media	Result
1.1.1	Oral Toxicity test	16 CFR 1500.3	Rat	Zero risk
1.1.2	Skin Irritation test	16 CFR 1500.41	Rabbit	Zero irritation
1.1.3	Eye irritation test	16 CFR 1500.42	Rabbit	All Zero risk, no irritation
1.1.4	Cytotoxicity test	ISO10993-5	L-929 cells (mouse fibroblast)	Test in 24hours, no toxic or change the Morphology
1.1.5	Inhalation test	OECD TG403	Mouse	Zero risk



Test Report	Report No: ASH18-033119-02	Issue Date: Aug 27 2018
Client name:	Future Tech Concepts Holdings Limited	
Client address:	Flat D2, Carmel Paint Buildings, 60 H Hong Kong	oi Yuen Road, Kwun Tong,
Sample name:	AIR DEFENDER NANO TIO2 SOL	
Sample Batch No .:	/	
Product Date:	/	
Manufacturer:	/	

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

SGS Sample No.:	ASH18-033119.001
Date of sample received:	Jul 11 2018
Testing period:	Jul 11 2018 ~ Aug 21 2018

# **TEST(S) REQUESTED:**

Selected test(s) as requested by applicant

TEST METHOD(S):

Please refer to the next page(s)

#### TEST RESULT(S):

Please refer to the next page(s)

#### CONCLUSION:

Oral LD₅₀ of the sample on Rat is more than 5000mg/kg, which was non-toxic substance.

#### SAMPLE DESCRIPTION: Sample in bottle

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Report No: ASH18-033119-02

Issue Date: Aug 27 2018

# TEST METHOD(S):

* Acute oral toxicity test: 16 CFR 1500.3

Test environment: Barrier system animal room. Certificate No. SYXK (Zhe) 2018-0003, room

temperature  $21.5^{\circ}C^{23.1}$ °C, relative humidity  $44.6\%^{-57.8}$ %.

Test animal: SD rat, obtained from Centre for Laboratory Animal of Zhejiang Province. Certificate No. SCXK (Zhe) 2014-0001.

No. of animals/sex: 5 males, 5 females

Sample preparation: 25.0012g samples were dissolved and poured into a 50mL volumetric flask respectively. The pure water was added to the calibration line, all these samples were fully shake into the reagent bottle, labeled standby.

Test method: The sample was administered as supplied at a limit dosage as 5000.24mg/kg. The animals were fasted for overnight before dosing. And the animals were fasted for 3 hours after dosing. The animals were checked for mortality or signs of morbidity at least twice a day during the observation period. The body weight of each animal was recorded once a week. Gross autopsies were performed on all animals that died during the observation period and on all survivors after 14 days observation.

# TEST RESULT(S):

息險稅團委用草

All animals No abnormal clinical symptoms and poisoning deaths were occurred in all experimental animals during 14 days observation. Body weights of animals were no significantly changes during the study. Gross anatomy no remarkable pathological findings on all survivor animals after 14 days observation.  $LD_{50}$ >5000.24mg/kg.

Sex	Number of	weight $(\overline{X} \pm SD)$ (g)				Mortolity	Rate of
	animals	0day	7day	14day	weight gain	Montality	Death
Male	5	214.1±4.63	256.7±7.38	301.1±4.16	87.0±7.14	0	0
Female	5	204.5±5.14	239.1±4.26	275.3±13.85	70.8±11.95	0	0

Attach Table 2 Results of acute oral toxicity t	est
-------------------------------------------------	-----

REMARK: This report is the replace of the report 231800027255 issued in 2018.08.17, the original report was voided.

Remark: * Test was carried out by NB CIQ laboratory assessed as competent.

*** End ***

#### SGS-CSTC Standards Technical Services (Shanghai) Co.,Ltd. Page 2 of 2

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Test Report	Report No: ASH18-033119-01	Issue Date: Aug 27 2018
Client name:	Future Tech Concepts Holdings Limited	I
Client address:	Flat D2, Carmel Paint Buildings, 60 H Hong Kong	oi Yuen Road, Kwun Tong,
Sample name:	AIR DEFENDER NANO TIO2 SOL	
Sample Batch No .:	/	
Product Date:	/	
Manufacturer:	/	

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

SGS Sample No.:	ASH18-033119.001
Date of sample received:	Jul 11 2018
Testing period:	Jul 11 2018 ~ Aug 21 2018

# TEST(S) REQUESTED:

Selected test(s) as requested by applicant

**TEST METHOD(S):** Please refer to the next page(s)

# TEST RESULT(S):

Please refer to the next page(s)

#### CONCLUSION:

The primary irritation score is 0.

#### SAMPLE DESCRIPTION: Sample in bottle

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Report No: ASH18-033119-01

Issue Date: Aug 27 2018

# TEST METHOD(S):

* Method of testing primary irritant substances: 16 CFR 1500.41

Test environment: Rabbit room of conventional condition. Certificate No. SYXK (Zhe) 2018-0003,

Room temperature 20.9°C~23.8°C, Relative humidity 52.9%~69.3%.

Test animal: New Zealand White Albino Rabbit, supplied by Yinhai rabbit specialty cooperative organization of Tongxiang Zhejiang Province, Certificate No. SCXK (Zhe) 2013-0056. No. of animals/sex: 6/not specified

Test method: 0.5mL sample was applied to clipped test site (abraded and intact skin) and wrapped with rubberized cloth for 24 hours.

Observation period: After 24 hours of exposure, the patches were removed and the resulting reactions were evaluated. Readings were again made 48 hours after the first reading.

# TEST RESULT(S):

隐隐惊地专用草

The value of skin reaction (abraded and intact skin) at any observation point was 0.

		1		cuen re		lesuit o	I metesti	ng prime			Juneos		r	r
			Erytl	hema a	nd esc	har for	mation		Eder	na form	ation			Prim arv
Ani mal	Ani mal	B.W	Intac	t skin	Abra sł	aded kin	Subto	Intact	t skin	Abra sk	aded kin	Subt	Total	irritat ion
INO.	sex	(кд)	24h	72h	24h	72h	tal	24h	72h	24h	72h	otal		scor e
1	8	2.5	0	0	0	0		0	0	0	0			
2	S	2.3	0	0	0	0		0	0	0	0			
3	Ŷ	2.5	0	0	0	0		0	0	0	0			
4	ð	2.5	0	0	0	0	0	0	0	0	0	0	0	0
5	Ŷ	2.6	0	0	0	0		0	0	0	0			
6	Ŷ	2.3	0	0	0	0		0	0	0	0			
	Value		0	0	0	0		0	0	0	0			

# Attach Table 1 Result of thetesting primary irritant substances

REMARK: This report is the replace of the report 231800027255 issued in 2018.08.17, the original report was voided.

Remark: * Test was carried out by NB CIQ laboratory assessed as competent.

*** End ***

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Test Report	Report No: ASH21-001085-02	Date: Feb 23 2021
Client name:	AirDefender International Company	Limited
Client address:	Flat 35, 7/F, Metro Centre, 21 LAM Hi Kong	ng Street Kowloon Bay, Hong
Sample name:	AirDefender [®] Antibacterial Solution	
Sample Batch No.:	AD4220	
Product Date:	/	
Manufacturer:	/	

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

Date of sample received:	2021-01-07
Testing period:	2021-01-07~2021-02-23
Test Requested:	Selected test(s) as requested by applicant
Test Method:	Please refer to the next page(s)
Test Result(s):	Please refer to the next page(s)

This Test Report supersedes the Test Report No. ASH21-001085-01 issued by SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. Original test report will be invalid from today. " Sample name " information was modified by the request of the client after the Test Report was issued.

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|--|

Report No: ASH21-001085-02

Date: Feb 23 2021

Sample Description:

Specimen No.	SGS Sample ID	Description
1	ASH21-001085.001	sample in bag

TEST RESULT(S):

Test standard	16 CFR Part 1500.42
Test type	*Acute Ocular Irritation Test
T	Rabbit room of conventional condition. Certificate No. SYXK (Zhe) 2018-0003, Room
l est environment	temperature $20.5^{\circ}$ C $\sim$ 22.7 °C; Relative humidity 56.2% $\sim$ 67.4%.
	Healthy adult New Zealand Albino Rabbit, $2.27 \text{kg} \sim 2.88 \text{kg}$ , supplied by Yinhai rabbit
Test animal	specialty cooperative organization of Tongxiang Zhejiang Province, Certificate No.
	SCXK (Zhe) 2018-0002. Animal Quality Certificate No.: 20210117Cezz0610038319.
Number of animals/sex	6, female animals are nulliparous and non-pregnant
	In 24h before the test, 1drop of 2% fluorescein sodium solution was dropped directly
	on the cornea of the eyes of the animals. After 15s, the eyes were gently flushed with
	warm saline and examined under the hand slit-lamp, and only those animals without
Tradinad	eye defects or irritation shall be used. The 0.1mL of the original sample was placed in
Test method	one eye of each animal by gently pulling the lower lid away from the eyeball to form a
	cup into which the test sample was dropped. The lids were then gently held together for
	one second and the animal was released. The other eye, remaining untreated, was
	served as a control. The eyes were not washed after instillation of test sample.
Observation period	24h, 48h and 72h after dosage.
Results	No ocular reaction was observed at 24h, 48h and 72h after instillation of test sample.
	The test was regarded as negative, and the test sample was considered as non-irritant
Conclusions	under the non-flush test condition.

# Attached Table Result of the acute ocular Irritation Test

				Test condition: Non-flush
Animal No.	Sex	Body weight (kg)	Parts of eye	Observation Time Point

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Member of the SGS Group (SGS SA)



# Test Report Report No:

Report No: ASH21-001085-02

Date: Feb 23 2021

				24h	48h	72h	
			Cornea	0	0	0	
1	8	2.27	Iris	0	0	0	
			Conjunctivae	0	0	0	
			Cornea	0	0	0	
2	9	2.46	Iris	0	0	0	
			Conjunctivae	0	0	0	
			Cornea	0	0	0	
3	Ŷ	2.88	Iris	0	0 0		
	Conjunctiv	Conjunctivae	0	0	0		
			Cornea	0	0	0	
4	ð	2.59	Iris	0	0	0	
	Conjunctivae	0	0	0			
			Cornea	0	0	0	
5	5 3 2.62	5 👌 2.62 Iris	2.62	Iris	0	0	0
		Conjunctivae	0	0	0		
		2 2.35	Cornea	0	0	0	
6	Ŷ		Iris	0	0	0	
			Conjunctivae	0	0	0	



#### **Remark:**

*Test items were carried out by Ningbo Customs District Technology Center assessed as competent.

*** End ***



邮编:200233

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1 (86-21) 6140 2547



Test Report	Report No: ASH21-010934-01	Date: Mar 26 2021	
Client name:	AirDefAirDefender International International Company Limited	Company Limitedender	
Client address:	Flat 35, 7/F, Metro Centre, 21 LAM Hing Street Kowloon Bay, Hong Kong		
Sample name:	AirDefender [®] Anti-bacterial Solu	ution	
Sample Batch No.:	/		
Product Date:	/		
Manufacturer:	/		

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Date of sample received:	Mar 01 2021
Testing period:	Mar 01 2021 ~ Mar 26 2021
Test Requested:	Selected test(s) as requested by applicant
Test Method:	Please refer to the next page(s)
Test Result(s):	Please refer to the next page(s)

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Report No: ASH21-010934-01

Date: Mar 26 2021

Sample Description:

Specimen No.	SGS Sample ID	Description
1	ASH21-010934.001	sample in bottle

# TEST METHOD(S):

ISO 10993-5:2009 Biological evaluation of medical devices – Part 5: Tests for in vitro cytotoxicity

Test Article: The sample preparation was in accordance with ISO 10993-12:2012. Extration condition is 24h at 37 °C in culture medium. The volume of extract is determined by the standard surface area.

Cell lines: L-929 cells (mouse fibroblast)

Medium: MEM medium (Gibco) with 10% FBS

Negative control: Medical PE gloves

Positive control: Medical latex gloves

General Procedure: Test on extracts(microscopic observation)

The prepared cell suspension was seeded in 96-well culture plate, set blank control, negative control, the positive control and the test sample group, inoculated with 100µL of cell suspension per well. Set CO₂ incubator (5% CO₂, the same below) 37  $^{\circ}$ C cultured for 24 h , discard the original culture medium. Adding fresh cell culture medium in blank control group, added extracts of the negative control in negative control group, added positive control solution or positive control extracts in the positive control group, added the extracts of the experimental material in the test sample. The test volume is  $100\mu$ L per well, set CO₂ incubator cultured for 24h. Observed cell morphology under the microscope.

# **TEST RESULT(S)**:

Tests for in vitro cytotoxicity (test on extracts)

The cytotoxicity of the sample was grade 1, cell growth state in blank control, negative control and positive control is normal

Grade	Reactivity	Conditions of all cultures	
0	Nene	Discrete intracytoplasmatic granules, no cell	
0	None	lysis, no reduction of cell growth	
		Not more than 20 % of the cells are	
		round,loosely attached and without	
1	Slight	intracytoplasmatic granules, or show changes	
		in morphology; occasional lysed cells are	
		present; only slight growth inhibition	

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Page 2 of 3



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# Test Report Report No: ASH21-010934-01

Date: Mar 26 2021

		observable.
2	Mild	Not more than 50 % of the cells are round, devoid of intracytoplasmatic granules, no extensive cell lysis; not more than 50 % growth inhibition observable.
3	Moderate	Not more than 70 % of the cell layers contain rounded cells or are lysed; cell layers not completly destroyed, but more than 50 % growth inhibition observable.
4	Severe	Nearly complete or complete destruction of the cell layers.

### **CONCLUSION:**

The cytotoxicity of the sample was grade 1, which is slight cytotoxic. The negative positive controls have the expected response in the test system.



*** End ***

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<b>I EST REPORT</b> Report No: ASH21-010951-01 Date: A	Apr 20 2021
Client name: AirDefender International Company Limited	
Client address: Flat 35, 7/F, Metro Centre, 21 LAM Hing Street Ko Kong	owloon Bay, Hong
Sample name: AirDefender [®] Anti-bacterial Solution	
Sample Batch No.: /	
Product Date: /	
Manufacturer: /	

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

Date of sample received:	2021-03-01
Testing period:	2021-03-01 ~2021-04-20
Test Requested:	Selected test(s) as requested by applicant
Test Method:	Please refer to the next page(s)
Test Result(s):	Please refer to the next page(s)

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SGS-CSTC Standards Technical Services (Shanghai) Co.,Ltd. Page 1 of 4 Report No: ASH21-010951-01

Date: Apr 20 2021

Sample Description:

Specimen No.	SGS Sample ID	Description
1	ASH21-010951.001	sample in bag

# TEST RESULT(S):

Test Item: Acute inhalation toxicity test

Test Standard: OECD TG 403

Conclusions: Under the conditions of this test, Inhalation  $LC_{50}$  of the sample on ICR mice is more than 21.9mg/L.

# Acute inhalation toxicity test

#### 1. Materials and methods

# 1.1. Sample preparation

Original sample

- 1.2. Experimental animals and feeding environment
- 1.2.1. Experimental animals

Species: mice;

Strain: ICR;

Microbial status: SPF;

Quantity: 6;

Sex: 3 males, 3 females, females were nulliparous and non-pregnant;

Weeks of age: 4 ~ 5 weeks

Body weight:  $18g \sim 22g$ , Body weight was in an interval within  $\pm 20\%$  of the mean weight of animals day

# 0;

Animal source: Laboratory Animal Center for Hangzhou Medical College;

Experimental Animal Production License Number: SCXK (Zhe) 2019-0002;

Animal Quality Certificate No.: 20210323Abba0100018337.

SGS-CSTC Standards Technical Services (Shanghai) Co.,Ltd. Page 2 of 4


#### Report No: ASH21-010951-01

Date: Apr 20 2021

1.2.2. Feeding environment

Facilities: Barrier system;

Temperature: 23.2°C ~ 24.8°C;

Relative humidity: 47.9% ~ 61.2%;

Experimental Animal Use License Number: SYXK (Zhe) 2018-0003.

1.2.3. Feed

Name: Co 60-irradiated standard commercial pelleted rat feed; Manufacturers: Jiangsu Xietong Pharmaceutical Bio-engineering Co., Ltd.

Production License Number: Susi license (2019) 01008;

Production Date: 2021.01.05;

Quality guarantee period: 6 months;

Qualification certificate number: No.120210105024.

1.2.4. Drinking water

Grade I RO ultrafiltration water (The free chlorine in water was kept at 2-3ppm for sterilization by adding sodium hypochlorite) was provided for animals to drink *ad libitum* by the spout.

#### 1.3. Test method

Before the experiment, the animals were acclimatized in the laboratory animal room environment for 7 days. The sample was administered as supplied at a limit dose. Using a single-concentration oral and nasal exposure system, the parameters were set before the exposure (concentration 20mg/L, average aerosol flow 9.072L/min, average dilution flow 0.305L/min, average pumping flow 1.986L/min). The results of the operation (concentration 21.9mg/L) were obtained directly after the end of the exposure, and the cumulative injection was 47.6g. Inhalation was conducted for 4 hours at a time. The animals were observed for signs of toxicity or behavioral changes frequently per day thereafter. Individual weights were recorded weekly. Gross autopsies were performed on all animals that died during the observation period and on all survival animals after 14 days.

2. Results

Neither abnormal clinical symptoms nor poisoning deaths occurred in all experimental animals during 14 days observation. Body weights of animals were no significantly changes during the study. Gross anatomy no

SGS-CSTC Standards Technical Services (Shanghai) Co.,Ltd. Page 3 of 4



# Test ReportReport No: ASH21-010951-01Date: Apr 20 2021

remarkable pathological findings on all survivor animals after 14 days observation.  $LC_{50}>21.9$  mg/L. (See Table 1).

#### 3. Conclusions

Under the conditions of this test, Inhalation  $LC_{50}$  of the sample on ICR mice is more than 21.9mg/L.

Sex	Number of animals	weight ( $\overline{X} \pm SD$ ) (g)					Rate		
		0 day	1day	3 days	7 days	14 days	14 days weight gain	Mortality	of death
Male	3	21.1±0.42	21.9±0.47	23.3±0.50	25.3±0.42	30.6±0.25	9.4±0.40	0	0
Female	3	18.8±0.47	19.3 <b>±</b> 0.49	20.3±0.42	22.3±0.25	25.2 <b>±</b> 0.70	6.3 <b>±</b> 0.32	0	0

Table 1 Results of acute inhalation toxicity test

#### **Remark:**

Test items were carried out by Ningbo Customs District Technology Center assessed as competent.

*** End ***

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# 一世界公司"



# 1.2 365 Days simulation

- **1.2.1** Test of antimicrobial activity
- **1.2.2** Duration checked with 2000 rubbing test
- 1.2.3 Antialcohol test

	Name	STANDARD	Test Media	Result
121	Test of antimicrobial	ISO22196·2011	Coated Glass	99.9% reduction rate
1.2.1	activity	10022170.2011	Could Glubb	effectiveness in 1 year
	Duration checked with	ISO105X12:2016		Antibacterial activity of
1.2.2	2000 rubbing test	and	Coated Textile	textile products over log 6
		ISO 20743:2013		and strong efficacy
				Over 99.99% reduction rate
1.2.3	Antialcohol test	ISO22196:2011	Coated Glass	to prove its ability under
				normal cleaning



ASH20-077749-02

Date: 21 Jan 2021

Client Name:AirDefender International Company LimitedClient Address:Flat 35, 7/F, Metro Centre, 21 LAM Hing Street Kowloon Bay, Hong Kong

Sample Name:	AirDefender [®] Coated Glass	
Manufacturer:	1	
Sample Batch No.:	1	
Production Date:	1	

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

Date of Sample Received :	11 Dec 2020
Testing Period :	11 Dec 2020 - 21 Jan 2021
Test Requested :	Selected test(s) as requested by client
Test Method :	Please refer to next page(s).
Test Result(s) :	Please refer to next page(s).

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Test Report	ASH20-077749-02
Sample Description :	

Specimen No.SGS Sample IDDescription1ASH20-077749.001sample in bag

#### Test Result(s) :

Test Requested : Test of antimicrobial activity

Test Method : ISO 22196:2011 Measurement of antibacterial activity on plastics and other non-porous surfaces

#### ASH20-077749.001

Test organism(s)	Staphylococcus aureus ATCC 6538P
Concentration of bacteria (cells/mL)	4.2x10^5
Volume of test inoculum (mL)	0.4
U₀	4.00
Ut	5.07
At	1.97
B (cells/cm²)	1.2x10^5
C (cells/cm²)	93
R	3.1
*The antibacterial activity rate (%)	99.9

Notes :

**After Accelerated Aging tested for antibacterial activity Test Method: ASTM F 1980-16 Test Condition: Accelerated aging temperature: 60 °C Accelerated aging time: 3.74 weeks Lab Environmental Condition:  $23 \pm 2$  °C,  $50 \pm 5$  % RH Note: The data as follow were provided by client. 1.Past life: 1 year 2.Q10 value: 2 3.Ambient temperature: 22°C 4.The simulated shelf life: 1 year.

**The sample is the same as ASH20-077748-01, Test address:2F, Building 9, No.69, 1159 East Kangqiao Rd, Pudong District, Shanghai

1. The control sample is plastic film without antimicrobial activity, provided by SGS laboratory.

2.U₀: the average of the common logarithm of the number of viable bacteria(cells/cm²) recovered from the untreated test specimens immediately after inoculation.

3.Ut: the average of the common logarithm of the number of viable bacteria(cells/cm²) recovered from the

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#### Page 2 of 3



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ASH20-077749-02

Date: 21 Jan 2021

untreated test specimens after 24 h.

4.At: the average of the common logarithm of the number of viable bacteria(cells/cm²) recovered from the treated test specimens after 24 h.

5.R: the value of antimicrobial activity,R=Ut-At.

6.*The calculation formula of the antibacterial activity rate is 【(B-C)/B】*100%;

B: arithmetic average of the numbers of bacteria obtained from control samples after 24 h incubation(cells/cm²);

C: arithmetic average of the numbers of bacteria obtained from samples after 24 h incubation(cells/cm²).

7.Pre-treatment: Ultraviolet sterilization for 30min

8.Test the surface without circle

Sample photo:





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*** End ***

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ASH20-072073-01

Date: 08 Dec 2020

Client Name:AirDefender International Company LimitedClient Address:Flat 35, 7/F, Metro Centre, 21 LAM Hing Street Kowloon Bay, Hong Kong

Sample Name:	AirDefender [®] Coated Textile	
Manufacturer:	1	
Sample Batch No.:	/	
Production Date:	/	

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

Date of Sample Received :	19 Nov 2020
Testing Period :	19 Nov 2020 - 08 Dec 2020
Test Requested :	Selected test(s) as requested by client
Test Method :	Please refer to next page(s).
Test Result(s) :	Please refer to next page(s).

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Test Report		ASH20-072073-01	Date: 08 Dec 2020
<u>Sample Descripti</u>	on :		
Specimen No.	SGS Sample ID	Description	
1	ASH20-072073.001	sample in bag	
Test Result(s) :			
Test Requested : Antibacterial Assessment for the submitted sample			
Test Method : ***ISO 105 X12: 2016Rubbing 2000 times(1000 tim		16Rubbing 2000 times(1000 times to	o and 1000 times fro)

ISO 20743:2013 Textiles-Determination of antibacterial activity of textile products: 8.1 Absorption method

#### ASH20-072073.001

Test organism(s)	**Pseudomonas aeruginosa ATCC 15442
Test inoculum (CFU/mL)	1.6x10^5
F	2.8
lgCt	7.3
lgC0	4.5
G*	-3.2
lgTt	1.3
IgT0	4.4
A	6.0
Comment	Pass:Strong



Notes :

The control sample was 100% cotton fabric, provided by SGS lab.

F: Growth value of F on the control specimens (F=lgCt-lgC0);

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G*: Growth value of G on the antibacterial testing specimens (G=lgTt-lgT0);

A: antibacterial activity value (A=F-G);

IgCt: common logarithm of arithmetic average of the numbers of bacteria, obtained from three control specimens after 24 h incubation;

IgC0: common logarithm of arithmetic average of the numbers of bacteria, obtained from three control specimens immediately after incubation;

IgTt: common logarithm of arithmetic average of the numbers of bacteria, obtained from three test specimens after 24 h incubation;

IgT0: common logarithm of arithmetic average of the numbers of bacteria, obtained from three test specimens immediately after incubation.

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ASH20-072073-01

Date: 08 Dec 2020

The sterilization method was UV sterilization 30min.

The testing specimens incubation time was 24 h.

The testing measuring method was plate count method.

* In case of C0> T0, substitute C0 for T0.

**According to client's requirement, judge with reference to ISO20743:2013.

The efficacy of antibacterial property requirement of ISO20743:2013: Significant: 2.0≤A<3.0,Strong: A≥3.0 ***Test item(s) was/were not included in the CNAS Accredited Schedule for our laboratory.The test address of the project is 2F, Building 9, No.69, 1159 East Kangqiao Rd, Pudong District, Shanghai, P.R.China.

Sample photo:





SGS authenticate the photo on original report only

*** End ***

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#### Page 3 of 3







ASH20-080039-02

Date: 05 Jan 2021

Client Name:AirDefender International Company LimitedClient Address:Flat 35, 7/F, Metro Centre, 21 LAM Hing Street Kowloon Bay, Hong Kong

AirDefender [®] Antibacterial Solution Coated Glass
1
1
1

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

Date of Sample Received :	22 Dec 2020
Testing Period :	22 Dec 2020 - 31 Dec 2020
Test Requested :	Selected test(s) as requested by client.
Test Method :	Please refer to next page(s).
Test Result(s) :	Please refer to next page(s).
This Test Depart supercades the	Test Depart No. ACUSO 080030 04 leaved by CCC CCTC Standay

This Test Report supersedes the Test Report No. ASH20-080039-01 issued by SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. Original test report will be invalid from today.

Unless otherwise stated the results shown in this test report refer only to the items tested, and for clients internal use only, not to the society has the proof function. This document cannot be used for improper publicity, without prior written approval of the SGS.







SGS Authorized Signature

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#### Page 1 of 3

劇論:200233



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Test Report		ASH20-080039-02	
Sample Descrip	<u>tion :</u>		
Specimen No.	SGS Sample ID	Description	
1	ASH20-080039.001	sample in bag	

#### Test Result(s) :

Test Requested : Test of antimicrobial activity

Test Method : ISO 22196:2011 Measurement of antibacterial activity on plastics and other non-porous surfaces

Date: 05 Jan 2021

#### ASH20-080039.001

Test organism(s)	Staphylococcus aureus ATCC 6538P
Concentration of bacteria (cells/mL)	8.2x10^5
Volume of test inoculum (mL)	0.4
U₀	4.31
Ut	5.65
At	-0.20
B (cells/cm²)	4.5x10^5
C (cells/cm²)	<0.63
R	5.9
*The antibacterial activity rate (%)	>99.99

Notes :

1.The control sample is plastic film without antimicrobial activity, provided by SGS laboratory. 2.U₀: the average of the common logarithm of the number of viable bacteria(cells/cm²) recovered from the 验检测专用 untreated test specimens immediately after inoculation.

3.Ut: the average of the common logarithm of the number of viable bacteria(cells/cm²) recovered from the untreated test specimens after 24 h.

4.At: the average of the common logarithm of the number of viable bacteria(cells/cm²) recovered from the treated test specimens after 24 h.

5.R: the value of antimicrobial activity,R=Ut-At.

6.* The calculation formula of the antibacterial activity rate is 【(B-C)/B】*100%;

B: arithmetic average of the numbers of bacteria obtained from control samples after 24 h incubation(cells/cm²);

C: arithmetic average of the numbers of bacteria obtained from samples after 24 h incubation(cells/cm²). 7.Pre-treatment: The surface of test specimen was wiped with 70% ethanol, rinsed with sterile water and let it air-dry.

8.Test the remarked surface without dots.

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SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

#### Page 2 of 3

虧餘:200233



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Technical Service



ASH20-080039-02

Date: 05 Jan 2021

Sample photo:



SGS authenticate the photo on original report only

*** End ***



SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

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#### Page 3 of 3

虧鑰:200233



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# 1.3 Antibacterial & Antivirus Effectiveness Proof

	Name	STANDARD	Test Media	Result
1.3.1	Eurovir Hygiene-Labor GmbH_ARSCOV2- TGEV-Coronavirus	EN 14476:2019	60min.	Log > 4.1
1.3.2	Eurovir Hygiene-Labor GmbH_SARS- Vacciniavirus	EN 14476:2019	60min.	Log > 4.62
1.3.3	Nissenken Quality Evaluation Center_H1N1(ATCC VR-1469)	ISO 21702:2019	Coated Glass	Log > 4.3
1.3.4	Anti Aspergillus niger	ISO 13629-2:2014	100% cotton fabric	Log > 4.7
1.3.5	Anti Escherichia.coli	JISL 1902:2008	White Colth	Log > 6.6
1.3.6	Anti Klebsiella pneumoniae	ISO 20743:2013	100% cotton fabric	Log > 6.3
1.3.7	Anti Legionella pneumophila	JISL 1902:2008	White Colth	Log > 5.2
1.3.8	Anti Listeria monocytogenes	JISL 1902:2008	White Colth	Log 3.8
1.3.9	Anti MRSA	JISL 1902:2008	White Colth	Log > 2.7
1.3.10	Anti Salmonella typhimurium	ISO 20743:2013	100% cotton fabric	Log > 5.8
1.3.11	Anti Alpha Hemolytic Streptococcus	ISO 20743:2013	100% cotton fabric	Log > 6.2

# - Cover sheet / Short test report -

Principal: Airdefender International Company Limited Rm 35,7/F, BLK 2, Metro Centre, 21 Lam Hing Street, Kowloon Bay, Kowloon, Hong Kong

This summary report is based on the test:

 Examination of the virucidal activity of the disinfectant products <u>airDefender</u> against the *Transmissible Gastroenteritis Virus of Swine (TGEV; strain: Toyama 36)* using the suspension test method following EN 14476:2019 - Screening test S4 at a temperature of T = 20 °C from 24.06.2020

#### The present summary report consists of the following parts:

1.	Cover sheet [1 page]	$\boxtimes$
2.	Summary of the test protocol(s) [2 pages]	$\boxtimes$

#### Co-applicable documents:

- 1. DIN EN 14476:2019
- 2. Finalised test protocol of the screening test S4 dated 14.07.2020

This summary report has been finalised and released:

D. a. ful

Date/Signature:

08.08.2020

Dr. Ch. Jursch, Laboratory Manager

Eurovir [®] Hygiene-Labor GmbH	Short Report: Examination of the virucidal activity of a disinfectant
Antivirale Validierung & Rabies	product - using the suspension test method following EN 14476

#### Information about the testing

Principal:	Airdefender International Company Limited	Test run:	S4 / TGEV-Coronavirus
Product(s):	airDefender	Test date:	24.06.2020
Test system:	TGEV (Toyama 36) + ST75/2 cells	Analysis:	01.07.2020 (7 p.i.)

#### Test methodology and test parameters

airDefender

Test method:Screening test using the methodology of the EN 14476 (quantitative virucidal suspensions test)Test mixture:1 VT protein load + 1 VT virus suspension + 8 VT neat productProtein load:"clean conditions" (low protein load)Test parameter:T = 20 °C / t = 60 min.

#### Tested product sample(s)

```
1<sup>st</sup> product:
```

[Product sample tested as received; Arrival: 29.04.2020; Storage at RT; the product under test was introduced into the experimental test with a preliminary product designation]

#### Tab. 1: Weight of content

Set	Product (s)	Product conc.	Product conc. in test	Dosage	pH ¹ of Working Sol.
#1	airDefender	undiluted (neat product)	80%	n.a.	not reliably measurable

¹ = pH was constantly drifting. The composition of the product under test was not communicated but this effect is typical for e.g. quarternary ammonium compounts which covers the pores of the electrode.

#### Test system:

- Transmissible Gastroenteritis Virus of Swine (TGEV); strain: Toyama 36 (Origin: Virusbank der BFA f. Viruskrankheiten der Tiere; Friedrich Löffler-Institut, Insel Riems, Germany)
- ST75/2 cells (foetal testis cells of swine) (Origin: Robert Koch-Institute, Berlin, Germany)

#### <u>Test results</u>

#### 1. Annotations:

- No changes were made to the test plan
- No abnormalities were observed.

#### 2. Virus titration:

#### Tab. 2.1: Virus control (Virus titration: by limiting dilution)

Samples	VK-1a	VK-1b	Ø
Samples	Virus control		
Titer/test vol. (Ig ID ₅₀ ) ¹	5,43 ± 0,35	5,43 ± 0,35	5,43
Average ± CI (95%) ¹		6,43 ± 0,25 / mL	

¹ = calculation of virus titer and its 95% confidential interval was performed according to EN 14476:2019

#### Tab. 2.2: Cytotoxicity control (Virus titration: by limiting dilution)

Samples	Tox Test	T-1
Samples	data of cytotoxicity test (T1; 18.06.2020)	Cytotoxicity (actual test run)
Titer/test vol. (Ig ID ₅₀ ) ¹	3,45 / mL	2,75 / mL

¹ = calculation of virus titer and its 95% confidential interval was performed according to EN 14476:2019.

SOP_AV_01-02_Viruzidie	ShortRep_Airdefender Int_TGEV_06.08.2020	Seite 1 von 2

Samples	In-1a	In-1b	Ø
Parameter		Inactivation	
Titer/Test vol. (Ig ID₅₀)	≤ 1,75	≤ 1,75	≤1,75
Average ± K (95%) ¹		$\leq$ 2,75/mL	
Reduction ² (Ig ID ₅₀ ± CI [95%])	on ² (95%]) ≥ 3,68 ± 0,25		

Tab. 2.3: Virus inactivation	(Virus titration: by limiting dilution)
------------------------------	-----------------------------------------

¹ = virus titer and its 95% confidential interval were calculated according to EN 14476:2019

 2  = virus reduction = titer of virus control (Ig ID₅₀) minus titer of sample (Ig ID₅₀)

Tab. 2.4: Virus inactivation	(Virus titration: by La	rge Volume Plating [LVP])
------------------------------	-------------------------	---------------------------

Complete	In-1		
Samples	Inactivation		
Dilution factor (VF)	1.000		
Sample vol. analysed	10 μL + 10 μL = 20 μL		
Cell cultures inoculated	96		
Virus positive cells	0		
Virus input [mL]	6,43 ± 0,25		
Titer/test vol. (Ig ID₅₀)	≤ 2,33 / mL		
Reduction ² (lg ID ₅₀ ± CI [95%])	≥4,10 ± 0,25		

¹ = virus titer and its 95% confidential interval were calculated according to EN 14476:2019

 2  = virus reduction = titer of virus control (lg ID₅₀) minus titer of sample (lg ID₅₀)

#### Conclusions:

- When the product *airDefender* (neat product) was introduced into test under "clean conditions" no residual test virus was detected above the cytotoxicity level (lg TD₅₀ = 2,75/mL; cf. Tab. 2.3).
- Using the LVP-titration method also no residual virus was detected with the 1.000-fold diluted test sample. With the Poisson-formula applied the (virtual) virus titer amounted to lg  $ID_{50} \le 2,33/mL$ , corresponding to a virus reduction of RF  $\ge 4,10 \pm 0,25$  (cf. Tab. 2.4).
- With the present screening test the TGEV-Coronavirus (cf. Test system) was used as the test virus. This virus is a member of the virus family *coronaviridae* to which SARS-CoV and SARS-CoV-2 also belong. Based on the data as obtained a basic virucidal activity against the coronaviruses was demonstrated.
- With respect to product validation a complete validation test according to EN 14476 vs. coronavirus (virus claim: specifically virucidal active against coronaviruses) can be striven.
- In my opinion, however, a complete validation test according to EN 14476 vs. Vacciniavirus is more advantageous. With a successful testing vs. Vacciniavirus a virucidal activity against all enveloped virus can be claimed. This virucidal claim includes (for example) HIV, HBV, HCV, the influenza viruses, the corona viruses [incl. SARS-CoV-2] and others.

# - Cover sheet / Short test report -

Principal: Airdefender International Company Limited Rm 35,7/F, BLK 2, Metro Centre, 21 Lam Hing Street, Kowloon Bay, Kowloon, Hong Kong

This summary report is based on the test:

 Examination of the virucidal activity of the disinfectant product <u>airDefender</u> against <u>Vacciniavirus</u> (<u>Elstree</u>) using the suspension test method following EN 14476:2019 - Screening test S4 at a temperature of T = 20 °C from 24.06.2020

#### The present summary report consists of the following parts:

1.	Cover sheet [1 page]	$\boxtimes$
2.	Summary of the test protocol(s) [2 pages]	$\boxtimes$

#### Co-applicable documents:

- 1. DIN EN 14476:2019
- 2. Finalised test protocol of the screening test S4 dated 14.07.2020

This summary report has been finalised and released:

Do. a. Jul

Date/Signature:

07.08.2020

Dr. Ch. Jursch, Laboratory Manager

Eurovir [®] Hygiene-Labor GmbH	Short Report: Examination of the virucidal activity of a disinfectant
Antivirale Validierung & Rabies	product - using the suspension test method following EN 14476

#### Information about the testing

Test system.	vaccillavilus ( <i>Eistree</i> ) + vero-76 cells	Anulysis.	08.07.2020 (14 p.1.)
Tast system:	Vacciniavirus (Eletron) + Varo 76 colle	Analysis	00 07 2020 (14 m ; )
Product(s):	airDefender	Test date:	24.06.2020
Principal:	Airdefender International Company Limited	Test run:	S4 / Vacciniavirus

#### Test methodology and test parameters

airDefender

Test method:Screening test using the methodology of the EN 14476 (quantitative virucidal suspensions test)Test mixture:1 VT protein load + 1 VT virus suspension + 8 VT neat productProtein load:"clean conditions" (low protein load)Test parameter:T = 20 °C / t = 60 min.

#### Tested product sample(s)

```
1<sup>st</sup> product:
```

[Product sample tested as received; Arrival: 29.04.2020; Storage at RT; the product under test was introduced into the experimental test with a preliminary product designation]

#### <u>Tab. 1:</u> Weight of content

Set	Product (s)	Product conc.	Product conc. in test	Dosage	pH ¹ of Working Sol.
#1	airDefender	undiluted (neat product)	80%	n.a.	not reliably measurable

¹ = pH was constantly drifting. The composition of the product under test was not communicated but this effect is typical for e.g. quarternary ammonium compounts which covers the pores of the electrode.

#### Test system:

- Vacciniavirus (strain: Elstree)
   (Origin: Institute of virology and antiviral therapy of the University of Jena, Germany)
- Vero-76 cells (Origin: Institute of virology and antiviral therapy of the University of Jena, Germany)

#### <u>Test results</u>

#### 1. Annotations:

- No changes were made to the test plan
- No abnormalities were observed.

#### 2. Virus titration:

#### Tab. 2.1: Virus control (Virus titration: by limiting dilution)

Complex	VK-1a	VK-1b	Ø
Samples		Virus control	
Titer/test vol. (Ig ID ₅₀ ) ¹	5,95 ± 0,49	5,95 ± 0,57	5,95
Average ± CI (95%) ¹		6,95 ± 0,39 / mL	

¹ = calculation of virus titer and its 95% confidential interval was performed according to EN 14476:2019

#### Tab. 2.2: Cytotoxicity control (Virus titration: by limiting dilution)

Samplas	Tox Test	T-1
Samples	data of cytotoxicity test (T1; 18.06.2020)	Cytotoxicity (actual test run)
Titer/test vol. (Ig ID ₅₀ ) ¹	3,45 / mL	3,45 / mL

¹ = calculation of virus titer and its 95% confidential interval was performed according to EN 14476:2019.

SOP	AV 0	1-02	Viruzidie
_		_	

Complex	In-1a	In-1b	Ø
Samples	l	nactivation: neat / 60 min. / C	с
Titer/test vol. (lg ID₅₀)	≤2,45	≤ 2,45	≤2,45
Average ± CI (95%) ¹		$\leq$ 3,45 / mL	
<b>Reduction</b> ² (lg ID ₅₀ ± CI [95%])		≥ 3,50 ± 0,39	

Tab. 2.3: Virus inactivation	(Virus titration: by limiting dilution)
------------------------------	-----------------------------------------

¹ = virus titer and its 95% confidental interval were calculated according to EN 14476:2019

 2  = virus reduction = titer of virus control (lg ID_{50}) minus titer of sample (lg ID_{50})

Tab. 2.4: Virus inactivation (Virus titration: by Large Volume Plating [LVP])

Samples	In-1
Samples	Inactivation: neat / 60 min. / CC
Dilution factor (VF)	1.000
Sample vol. analysed	10 μL + 10 μL = 20 μL
Cell cultures inoculated	96
Virus positive cells	0
Virus input [mL]	6,95 ± 0,39
Titer/test vol. (Ig ID ₅₀ )	≤ 2,33 / mL
Reduction ² (lg ID ₅₀ ± CI [95%])	≥4,62 ± 0,39

¹ = virus titer and its 95% confidential interval were calculated according to EN 14476:2019

 2  = virus reduction = titer of virus control (lg ID₅₀) minus titer of sample (lg ID₅₀)

#### **Conclusions:**

- When the product *airDefender* (neat product) was introduced into test under "clean conditions" no residual test virus was detected above the cytotoxicity level (lg TD₅₀ = 3,45/mL; cf. Tab. 2.3).
- Using the LVP-titration method also no residual virus was detected with the 1.000-fold diluted test sample. With the Poisson-formula applied the (virtual) virus titer amounted to lg  $ID_{50} \le 2,33/mL$ , corresponding to a virus reduction of RF  $\ge 4,62 \pm 0,34$  (cf. Tab. 2.4).
- Based on the present data as obtained in the corresponding screening test and to my opinion a complete validation test according to EN 14476 vs. Vacciniavirus (virucidal claim: "virucidal active against enveloped viruses") can be striven with the tested product. With this virucidal claim a virucidal activity against all enveloped virus is assumed (e.g. HIV, HBV, HCV, the influenza viruses, the corona viruses [incl. SARS-CoV-2] and others).
- From the data obtained it cannot be concluded whether or not a virucidal activity against the non-enveloped viruses is also given (virus claim: "limited virucidal PLUS" or "virucidal").

# 試験鑑定証明書

DTK20- 00415

20		T.	記参照			一般	財団法人	即常要
2	量	1	点			=>	センケン品質	評価セン
0 1	020年4月30日	に提出され	れた試料につい	いて試	験の結果、	下記の通りであるこ	とを証明します。	東京事
	式験試料	(1) Me	tamaterial Cos	ted Gl	ass Sample			
		はカノル	7 14 17 12					
и. п	研究項目	150 217		remen	t of antiviral a	ctivity on plastics ar	d other non-porou	s surfaces
	測定方法	プラーク	测定法			and a particula		
IV	試験ウイルス	t 1. Influe	nza A virus : A	/PR/8	/34 (H1N1)	ATCC VR-1469		
v.	試験結果	1 18 SA SA SA S						
	⊽ Influenza	A virus ; A/P	R/8/34 (H1N1)	ATC	C VR-1469			
	〈試験ウイル	ス液〉						
	感染価	(PFU/mL)	2.10 × 10	7				
	接種	量 (mL)	0.4					
	〈対照試料〉							
		区分		感	染価対数镇	]		
			接種直後	Uo	5.64			
	ポリエチ	レンフィルム	1hr反応後	Ut	5.64			
			24hr反応後	Ut	5.10			
	(試験試料)							
		区分		戚	染研対数值	抗ウイルス活性値		
		E./J		-	-1-10-7 7	R = Ut - At		
	(1)	原品	Thr反応後	At	5.06	0.6		
			24hr反応後	At	0.80	4.3		





# Nissenken Quality Evaluation Center

## 2-16-11, KURAMAE, TAITO-KU, TOKYO, JAPAN TELEPHONE : (03) 5809 - 1360

CERTIFICATE NUMBER	: DTK20-00415-1	(1/2
REQUEST DATE	: April 30, 2020	
ISSUE DATE	: May 18, 2020	

#### REQUESTER : airDefender International Company Limted

#### CERTIFICATE OF TESTING

Regarding the material submitted by the client described above, we hereby certify that our test results were as follows:

SAMPLES	- 31	(1)
The second second	- A	- 2024

Metamaterial Coated Glass Sample

TESTING ITEM	34	Testing of antiviral activity
TESTING METHOD	3	ISO21702:2019 Measurement of antiviral activity on plastics and other non-porous surfaces
		Measurement method : Plaque assay
TESTING VIRUS	ij.	1 . Influenza A virus ; A/PR/8/34 (H1N1) ATCC VR-1469

Nissenken Quality Evaluation Center TOKYO Laboratory

SIGNATURE - Chara

CHIEF OF LABORATORY

SIGNATURE

PERSON IN CHARGE

Test is according to submitted samples

#### TEST RESULT

REQUESTER : airDefender International Company Limted

CERTIFICATE NUMBER : DTK20-00415-1 (2/2) ISSUE DATE : May 18, 2020

Measurment Result

[Virus suspension]

Virus		Influenza A virus ; A/PR/8/34 (H1N1) ATCC VR-1469		
Infectivity titre	(PFU/mL)	2.10 × 10 ⁷		

[Final test]

control specimen

Virus	Specimen		Common logarithm	
		immediately after inoculation	$U_{\varphi}$	5.64
1 Control	Control	after 1h contact	Ut	5.64
		after 24h contact	Ut	5.10

control specimen: Polyethylene film

test specimen

Virus	Specimen		Common logarithm		$\begin{array}{l} Antiviral \ activity \ value \\ R = Ut \ \cdot \ At \end{array}$	
<b>1</b>	715	after 1h contact	At	5.06	0.6	
5	(i)	after 24h contact	AL	0.80	4.3	

* Transcribed from DTK19-07040 (Issued on April 21th, 2019)

Nissenken Quality Evaluation Center TOKYO Laboratory



Test Report	Report No: ASH17-024697-02	Date: Jun 29 2017
Client name:	TitanPE Technologies, Inc.	
Client address:	BD11, NO.415, GULANG ROAD, SHANGHAI	
Sample name:	Coating Suisse AGSOL5000	
Sample Batch No.:	R0613	
Product Date:	/	
Manufacturer:	TitanPE Technologies, Inc.	

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

SGS Sample No.:	ASH17-024697.001
Date of sample received:	Jun 13 2017
Testing period:	Jun 13 2017 ~ Jun 29 2017

#### TEST(S) REQUESTED:

Selected test(s) as requested by applicant: Antifungal activity test

#### TEST METHOD(S)/TEST RESULT(S):

Please refer to the next page(s)

#### CONCLUSION(S):

Test Fungal (Strain number)	Antifungal activity value A	Criterion of antifungal efficacy
Aspergillus niger ATCC 6275	>4.7	Fungistatic with full effect

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested, and for clients internal use only, not to the society has the proof function. This document cannot be used for publicity, without prior written approval of the SGS.



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Report No: ASH17-024697-02

Date: Jun 29 2017

#### TEST METHOD(S):

ISO 13629-2:2014 Textiles-Determination of antifungal activity of textile products-Part 2: Plate count method

#### TEST ORGANISM(S):

Aspergillus niger ATCC 6275

#### TEST RESULT(S):

Test Fungal	Aspergillus niger
(Strain number)	ATČC 6275
Concentration of spore suspension	2.3x10 ⁵
The growth value on the control fabric	+1.5
$(F=IgC_{t}-IgC_{0})$	(lgC _t + 6.1 , lgC ₀ + 4.6)
The growth value on the antifungal-treated samples	< -3.2
$(G=IgT_t-IgT_0)$	(IgT _t :<+ 1.3 , IgT _{0:} <+ 4.5)
The antifungal activity value	× 4 7
(A=F-G)	>4.1
Inoculation method	Absorption method
Sterilization method	Autoclave(121°C, 20min)

Remark:

Control fabtic:100% cotton fabric without fluorescent brighteners or other finish ,provided by SGS lab.  $C_t$  is the arithmetic average of the number of fungi obtained from three test samples of control fabric after (48±2)h incubation

 $C_0$  is the arithmetic average of the number of fungi obtained from three test samples of control fabric immediately after inoculation.

 $T_t$  is the arithmetic average of the number of fungi obtained from three antifungal-treated test samples after (48±2)h incubation

 $T_0$  is the arithmetic average number of the number of fungi obtained from three antifungal-treated test samples immediately after inoculation.

F: is the growth value on the control fabric

G: is the growth value on the antifungal-treated samples

A: is the antifungal activity value

Example of efficacy of antifungal property

Item	A value	Explanation
Criterion of antifungal efficacy	A<1	No effect
by antifungal activity value A in	2>A>1	Fungistatic with small effect
Formula	3>A>2	Fungistatic with medium effect
	A>3	Fungistatic with full effect
	Tt=0	Fungicidal effect

#### SGS-CSTC Standards Technical Services (Shanghai) Co.,Ltd. Page 2 of 3

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Report No: ASH17-024697-02

Date: Jun 29 2017

SAMPLE DESCRIPTION: sample in bag



*** End ***

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#### No: SHFDO100912172FDS1

Date: Sep 14 2010

Client name: TitanPE Technologies, Inc. Client address: BD 7, No.198, Changhe Road, Shanghai, PRC

#### The following sample(s) was/were submitted by/ on behalf of the client as:

Sample name: Photocatalytic Textile Batch No.: A1663 Manufacturer: TitanPE Technologies, Inc. SGS Reference No.: GZFDO100903654FD SGS Job no.: SHFDO100912172FD Date of receipt: Sep 01 2010 Testing period: Sep 01 2010 ~ Sep 09 2010

#### TEST(S) REQUESTED:

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

#### **TEST METHOD:**

JIS L 1902:2008 The Method of antibacterial test and assessment of antibacterial effectiveness for textiles , Chapter 10: Quantitative test (Absorption method)

#### TEST ORGANISMS:

Escherichia.coli ATCC 8739

#### CONCLUSION:

**Pass:** The Log value of bacteriostatic for *Escherichia.coli* is > 6.6, complies with JIS L 1902:2008 Specification for antibacterial finish (The bacteriostatic activity value shall be  $\geq$  2.0 for antibacterial finish).

Signed for and on behalf of SGS

Amy Gan

Authorized Signature

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#### No: SHFDO100912172FDS1

#### Date: Sep 14 2010

TEST RESULT(S):

**Test Report** 

Name of test bacteria (Strain number)	Escherichia.coli (ATCC 8739)
Concentration of inoculum (CFU/mL)	1.7×10 ⁵
The growth value on the control sample F ( $F=M_b-M_a$ )	+ 3.8 (M _b :+ 8.1 , M _a :+ 4.3)
The growth value on the antimicrobial-treated sample ( $\rm M_{c}\text{-}~M_{d})$	< - 2.8 (M _c :< + 1.3 _, M _d :+ 4.1)
Bacteriostatic activity value $S = (M_b - M_a) - (M_c - M_d)$	> 6.6
Bactericidal activity value $L = M_a - M_c$	> 3.0
Incubation time (h)	18
Measuring method	Plate count method

#### **REMARK:**

M_a: The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 0h.

 $M_b$ : The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 18h.

M_c: The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 18h.

 $M_{d}\!\!:$  The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 0h

The control sample is standard cotton cloth specified by JISL 1902:2008, provided by SGS lab.

#### SAMPLE DESCRIPTION: White cloth



*** End of Report***

#### Page 2 of 2

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Test Report	Report No: ASH18-048042-01	Issue Date: Oct 16 2018
Client name:	TitanPE Technologies, Inc.	
Client address:	BD11,NO.415,GULANG ROAD, SHAN	GHAI, 200331
Sample name:	AG425K	
Sample Batch No .:	ET001	
Product Date:	/	
Manufacturer:	TitanPE Technologies, Inc.	

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

SGS Sample No.:	ASH18-048042.001
Date of sample received:	Sep 25 2018
Testing period:	Sep 25 2018 ~ Oct 16 2018

#### TEST(S) REQUESTED:

SG

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

#### TEST METHOD(S)/ TEST RESULT(S):

Please refer to the next page(s)

#### CONCLUSION(S):

Name of test bacteria (Strain number)	Antibacterial value:A	Efficacy of antibacterial property	Comment
Klebsiella pneumoniae (ATCC 4352)	>6.3	Antibacterial value 2≤A<3, the efficacy of antibacterial property of the test fabric can be considered significant; Antibacterial activity A≥3, the efficacy of antibacterial property of the test fabric can be considered strong	Pass, the efficacy of antibacterial property of the test fabric can be considered strong

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Report No: ASH18-048042-01

Issue Date: Oct 16 2018

#### **TEST METHOD:**

ISO 20743:2013 Textiles-Determination of antibacterial activity of textile products: 8.1 Absorption method

#### **TEST ORGANISMS:**

Klebsiella pneumoniae ATCC 4352 TEST RESULT(S):

Name of test bacteria (Strain number)	Klebsiella pneumoniae (ATCC 4352)	
Concentration of inoculum (CFU/mL)	2.9x10 ⁵	
Difference of extremes for the three	Oh	24h
(condition: less than 1)	<0.1	<0.1
Difference of extremes for the three	Oh	24h
(condition: less than 2)	<0.1	<0.1
The growth value on the control sample F (F=lgCt-lgC0)	3.0 (lgC _t +7.7 lgC ₀ +4.7)	
The growth value on the antimicrobial- treated sample G (G =lgT _t -lgT ₀ )*	< -3.2 (IgT _{t:} <+ 1.3 , IgT _{0:} +4.5)	
Antibacterial activity value (A=F-G)	>6.3	
Measuring method	Plate count method	
Sterilization method	Autoclave	
Incubation time	24h	

**REMARK:** The control sample is 100% cotton fabric, provided by SGS lab. * In case of  $C_0 > T_0$ , substitute  $C_0$  for  $T_0$ .

#### SAMPLE DESCRIPTION:



*** End ***

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#### No: SHFDO120810413FD

Date: Sep 18 2012

Client name: Titanpe Technologies. Inc Client address: 1 Floor BD.7, ChangHe Road No.198.

The following sample(s) was/were submitted by/ on behalf of the client as (except SGS reference No. & SGS job No. & Date of receipt & Testing period):

Sample name: Sample Batch No./Date: / Manufacturer: / SGS job No.: SHFDO120810413FD Date of receipt: Aug 02 2012 Testing period: Aug 02 2012 ~ Sep 18 2012

#### **TEST(S) REQUESTED:**

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

#### **TEST METHOD:**

JIS L 1902:2008 The Method of antibacterial test and assessment of antibacterial effectiveness for textiles, Chapter 10: Quantitative test (Absorption method)

#### **TEST RESULT(S):**

Please refer to next page

#### **CONCLUSION:**

Pass: The Log value of bacteriostatic for * Legionella pneumophila is > 5.2, comply with JIS L 1902:2008 Specification for antibacterial finish (The bacteriostatic activity value shall be ≥ 2.0 for antibacterial finish).

*According to client's requirement, judge with reference to JIS L 1902:2008



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Page 1 of 2
Page 1
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#### No: SHFDO120810413FD

Date: Sep 18 2012

#### **TEST ORGANISMS:**

Legionella pneumophila ATCC33152

#### TEST RESULT(S):

Name of test bacteria (Strain number)	Legionella pneumophila (ATCC33152)
Concentration of inoculum (CFU/mL)	2.3×10 ⁵
The growth value on the control sample F (F= $M_b$ - $M_a$ )	+2.1 (M _b :+6.5 M _a :+4.4)
The growth value on the antimicrobial-treated sample ( $\rm M_c\text{-}M_d$ )	< -3.1 (M _c : < +1.3 , M _d :+4.4)
Bacteriostatic activity value S= (M _b -M _a )- (M _c -M _d )	> 5.2
Bactericidal activity value L= M _a -M _c	> 3.1
Incubation time (h)	18
Measuring method	Plate count method

#### **REMARK:**

M_a: The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 0h.

M_b: The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 18h.

- M_c: The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 18h.
- M_d: The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 0h
- CFU: Colony forming unit

The control sample is standard cotton cloth specified by JISL 1902:2008, provided by SGS lab.

#### SAMPLE DESCRIPTION: White cloth



*** End of Report***

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Test Report	Report No: ASH14-025972-01	Date: Sep 02 2014
Client name:	TITANPE TECHNOLOGIES, INC.	
Client address:	BD 7, NO. 198, CHANGHE ROAD, SHAI	NGHAI, PRC
Sample name:	AG425K Coated Sample	
Sample Batch No .:	1	
Product Date:	1	
Manufacturer:	TITANPE TECHNOLOGIES, INC.	

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

SGS Sample No.:	ASH14-025972.001
Date of sample received:	Aug 22 2014
Testing period:	Aug 22 2014 ~ Sep 02 2014

#### TEST(S) REQUESTED:

Selected test(s) as requested by applicant Antibacterial Assessment for the submitted sample

#### **TEST METHOD:**

JIS L 1902:2008 The Method of antibacterial test and assessment of antibacterial effectiveness for textiles, Chapter 10: Quantitative test (Absorption method)

#### TEST RESULT(S):

Please refer to the next page(s)

#### CONCLUSION:

**Pass:** The Log value of bacteriostatic for *Listeria monocytogenes* is 3.8, complies with JIS L 1902:2008 Specification for antibacterial finish (The bacteriostatic activity value shall be  $\geq$  2.0 for antibacterial finish). (According to client's requirement, judge with reference to JIS L 1902:2008)



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#### Report No: ASH14-025972-01

Date: Sep 02 2014

## TEST ORGANISMS:

**Test Report** 

Listeria monocytogenes 54001

#### TEST RESULT(S):

Name of test bacteria (Strain number)	Listeria monocytogenes (54001)
Concentration of inoculum (CFU/mL)	2.7x10 ⁵
The growth value on the control sample F (F= $M_b$ - $M_a$ )	+2.2 (M _b :+6.7 , M _a :+4.5)
The growth value on the antimicrobial-treated sample $(M_c\text{-}M_d)$	-1.6 (M _c :+2.9 , M _d :+4.5)
Bacteriostatic activity value S= (M _b -M _a )- (M _c -M _d )	3.8
Bactericidal activity value L= M _a -M _c	1.6
Incubation time (h)	18
Measuring method	Plate count method

#### **REMARK:**

 $M_a$ : The average of log value of bacteria obtained from the three control samples that inoculated the test germ after 0h.

 $M_b$ : The average of log value of bacteria obtained from the three control samples that inoculated the test germ after 18h.

- M_c: The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 18h.
- M_d: The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 0h

The control sample is standard cotton cloth specified by JISL 1902:2008, provided by SGS lab.

#### SAMPLE DESCRIPTION: 1 bag, ca.50g/bag, sample in bag



*** End of Report***

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#### No: SHFDO100912172FD1

Date: Sep 21 2010

Client name: TitanPE Technologies, Inc. Client address: BD 7, No.198, Changhe Road, Shanghai, PRC

#### The following sample(s) was/were submitted by/ on behalf of the client as:

Sample name: Photocatalytic Textile Batch No.: A1663 Manufacturer: TitanPE Technologies, Inc. SGS Reference No.: GZFDO100903654FD.2 SGS Job no.: SHFDO100912172FD Date of receipt: Sep 01 2010 Testing period: Sep 10 2010 ~ Sep 21 2010

#### TEST(S) REQUESTED:

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

#### **TEST METHOD:**

JIS L 1902:2008 The Method of antibacterial test and assessment of antibacterial effectiveness for textiles , Chapter 10: Quantitative test (Absorption method)

#### **TEST ORGANISMS:**

Methicillin Resistant Staphylococcus aureus ATCC 33591

#### **CONCLUSION:**

**Pass:** The Log value of bacteriostatic for *Methicillin Resistant Staphylococcus aureus* is > 2.7, complies with JIS L 1902:2008 Specification for antibacterial finish (The bacteriostatic activity value shall be  $\geq$  2.0 for antibacterial finish).

Signed for and on behalf of SGS

Authorized Signature

Page 1 of 2

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#### No: SHFDO100912172FD1

#### Date: Sep 21 2010

TEST RESULT(S):

**Test Report** 

Name of test bacteria (Strain number)	Methicillin Resistant Staphylococcus aureus (ATCC 33591)
Concentration of inoculum (CFU/mL)	1.1×10 ⁵
The growth value on the control sample F (F= $M_b$ - $M_a$ )	+ 2.1 (M _b :+ 6.4 , M _a :+ 4.3)
The growth value on the antimicrobial-treated sample $(M_c - M_d)$	- 0.6 (M _c :+ 3.4 , M _d :+ 4.0)
Bacteriostatic activity value S= (M _b -M _a )- (M _c -M _d )	2.7
Bactericidal activity value $L = M_a - M_c$	0.9
Incubation time (h)	18
Measuring method	Plate count method

#### **REMARK:**

M_a: The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 0h.

 $M_b$ : The average of log value of bacteria obtained from the three control sample that inoculated the test germ after 18h.

M_c: The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 18h.

 $M_d$ : The average of log value of bacteria obtained from the three antibacterial finishes that inoculated the test germ after 0h

The control sample is standard cotton cloth specified by JISL 1902:2008, provided by SGS lab.

#### SAMPLE DESCRIPTION: White cloth



*** End of Report***

#### Page 2 of 2

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Test Report	Report No: ASH15-026060-01	Date: Jul 30 2015
Client name:	TitanPE Technologies,Inc.	
Client address:	BD7, NO.198, CHANGHE ROAD, SHANGHAI	
Sample name:	AG-Series	
Sample Batch No .:	/	
Product Date:	/	
Manufacturer:	TIPE	

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

SGS Sample No.:	ASH15-026060.001
Date of sample received:	Jul 21 2015
Testing period:	Jul 21 2015 ~ Jul 30 2015

#### **TEST(S) REQUESTED:**

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

**TEST METHOD(S):** Please refer to the next page(s)

#### TEST RESULT(S):

Please refer to the next page(s)

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# **Test Report**

Report No: ASH15-026060-01

Date: Jul 30 2015

### **TEST METHOD:**

ISO 20743:2013 Textiles-Determination of antibacterial activity of textile products: 8.1 Absorption method

### **TEST ORGANISMS:**

Salmonella typhimurium AS 1.1194

### TEST RESULT(S):

Name of test bacteria (Strain number)	Salmonella typhimurium (AS 1.1194)	
Concentration of inoculum (CFU/mL)	1.3×	:10 ⁵
Difference of extremes for the three control	0h	24h
(condition: less than 1)	< 0.1	< 0.1
Difference of extremes for the three antibacterial	0h	24h
testing specimens(lg) (condition: less than 2)	< 0.1	< 0.1
The growth value on the control sample F (F=lgC _t - $lgC_0$ )	+2.9 (lgC _{t:} +7.1 , lgC _{0:} +4.2)	
The growth value on the antimicrobial-treated sample G (G =lgT _t -lgT ₀ )*	<-2.9 (lgT _{t:} <+1.3 , lgT _{0:} <+2.3)	
Antibacterial activity value (A=F-G)	> 5.8	
Measuring method	Plate count method	
Sterilization method	Autoclave(121°C,15min)	
Incubation time	24h	

**REMARK:** The control sample is 100% cotton fabric, provided by SGS lab. * In case of  $C_0 > T_0$ , substitute  $C_0$  for  $T_0$ .

### SAMPLE DESCRIPTION: Beige fabric



*** End ***

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Test Report	Report No:	ASH19-000911-02	Issue Date: Jan 16 2019
Client name: Client address: Sample name: Sample Batch No.: Product Date:	TitanPE Tech BD11,NO.415 AG420 08S43S-ET /	nologies,Inc. ,GULANG ROAD, SHANGHA	I, 200331
manufacturer:	TRANPE TECH	lologies, inc.	

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SGS Sample No.:	ASH19-000911.001
Date of sample received:	Jan 07 2019
Testing period:	Jan 07 2019 ~ Jan 15 2019

#### **TEST(S) REQUESTED:**

Selected test(s) as requested by applicant: Antibacterial Assessment for the submitted sample

**TEST METHOD(S):** Please refer to the next page(s)

### TEST RESULT(S):

Please refer to the next page(s)

This Test Report supersedes the Test Report No. ASH19-000911-01 dated Jan 16 2019 issued by SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. Original test report will be invalid from today.

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## **Test Report**

Report No: ASH19-000911-02

Issue Date: Jan 16 2019

CONCLUSION(S):

Name of test bacteria (Strain number)	Antibacterial value:A	Efficacy of antibacterial property	Comment
Alpha Hemolytic Streptococcus (CMCC 32213)	>6.2	Antibacterial value 2≤A<3, the efficacy of antibacterial property of the test fabric can be considered significant; Antibacterial activity A≥3, the efficacy of antibacterial property of the test fabric can be considered strong	Pass, the efficacy of antibacterial property of the test fabric can be considered strong

### SGS-CSTC Standards Technical Services (Shanghai) Co.,Ltd. Page 2 of 3



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## **Test Report**

Report No: ASH19-000911-02

Issue Date: Jan 16 2019

### **TEST METHOD:**

ISO 20743:2013 Textiles-Determination of antibacterial activity of textile products: 8.1 Absorption method

### **TEST ORGANISMS:**

CMCC (B) 32213

### TEST RESULT(S):

Name of test bacteria (Strain number)	Alpha Hemolytic Streptococcus (CMCC 32213)	
Concentration of inoculum (CFU/mL)	1.2x10 ⁵	
Difference of extremes for the three	0h	24h
control specimens(Ig) (condition: less than 1)	<0.1	<0.1
Difference of extremes for the three	0h	24h
(condition: less than 2)	<0.1	<0.1
The growth value on the control sample F (F=lgCt-lgC0)	+3.2 (lgC _t + 7.5 lgC ₀ +4.3)	
The growth value on the antimicrobial- treated sample G (G =lgT _t -lgT ₀ )*	e growth value on the antimicrobial- treated sample G (G =lgT _t -lgT ₀ )*	
Antibacterial activity value (A=F-G)	>6.2	
Measuring method	Plate count method	
Sterilization method	Autoclave	
Incubation time	24h	

**REMARK:** The control sample is 100% cotton fabric, provided by SGS lab. * In case of  $C_0 > T_0$ , substitute  $C_0$  for  $T_0$ .

### SAMPLE DESCRIPTION:



*** End ***

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