One-component special anti-fouling ceramic GlossWell #360 Type Anti-Viral

GlossWell #360 Type Anti-Viral is an SI-O bond-based moisture-curing inorganic coating. The cured film is hard and has excellent water repellency and mold release properties, as well as weather and chemical resistance. Unlike conventional inorganic paints, this product shows good adhesion to many base materials such as metals and plastics with just one coat. GlossWell #360 Type Anti-Viral is a special paint with antibacterial and antiviral properties.

[Features]

Excellent water and oil repellency and super demolding performance.

1. Good adhesion and can be used on various substrates with one coat. (*Confirm adhesion in advance)
2. It has excellent solvent resistance and electrical insulation, and the coating film is nonflammable.
3. It has antibacterial and anti-viral properties and is effective against various pathogenic viruses, bacteria and fungi.

[Painting conditions]

Painting Method	Sprays, brushes and rollers, dipping, etc.
Film Thickness	10~20μm
Application amount	50~100g /㎡
Paint Viscosity	9~10 seconds / HIS NK-2
Spray Gun Aperture	1.3~1.5mm ϕ
Air pressure	0.3~0.4MPa (3~4kgf/c ㎡)
Dry to the touch	20~30 minutes.
Room temperature drying	24 hours, full curing 3-4 days
Forced drying	Forced drying (70-80°C for 30 minutes). Then, after about 4 days of room temperature drying, it cures completely.

[Coating Performance]

Test case	Test conditions	Test results
Hardness	Use of Mitsubishi Pencil uni	2H
Adhesion test	Cellotape peeling test : 100 pieces of 2 mm square eyes	100/100
Impact Test	According to JIS K 5600-5-3 Drop test. 300g x 500mm (25.4mm diameter)	All clear
Acid resistance test	Spot test for 5% sulfuric acid solution: 23°C x 6 hours	All clear
Solvent resistance	Rubbing test (500 g load / 10 round trips)	All clear
	1) Ethanol	All clear
	2) Toluene	All clear
	3) Methyl ethyl ketone	All clear
Temperature and water resistance	Immersion in warm water at 40°C : 100 hours	All clear
Pollution resistance	Oil-based magic (black and red) dry cloth wiping	All clear
	Contamination with carbon black: check the color difference between contaminated and non-contaminated surfaces	⊿E = 0.5 or less
Weather resistance	Sunshine weather meter (2000 hours) : Gloss retention	More than 80%
Cold-heat cycle	60°C×3hr ⇔ -20°C×3hr (10 cycles)	All clear
Salt spray resistance	35°C, 5% saline for 500 hours	All clear
Volume resistivity	In accordance with JIS K6249, Ω-cm	4.0×10^{15}
Insulation resistance	KV/0.1mm	5.8
Antibacterial and antiviral properties	See attached test results.	
RoHS Substances	Without	

※ Material : Bonded steel plate / Film thickness: 6 to 8 μm / Curing conditions: 80°C x 30 minutes drying and leaving at room temperature for 5 days.

※ The above values are for reference only and are not standard values.

[Cautions for painting]

■ Paint Environment : Do not use in a poorly ventilated environment.

■ Pretreatment : Remove oil, moisture and dirt from the surface of the material by degreasing with a solvent.

■ Paint : Perform painting immediately. If left unattended for a long period of time, clogging and unevenness in the paint may result.

- The film thickness should be controlled to be within the specified range.

■ Drying : Ventilate and exhaust the product sufficiently to prevent organic gases from being generated during drying.

■ Storage: Store the paint in a cool, dark place.

- Since this paint reacts with moisture in the air, seal tightly after use.

■ Disposal : Follow the MSDS (Material Safety Data Sheet) for disposal of paint residues and liquid waste.

■ Handling Precautions : Do not use this product in flammable organic solvents, and do not use it in areas where there is a fire.

- Avoid contact with skin and mucous membranes, especially eyes, as there may be irritation.

- In case of contact with the product, wash it with plenty of water.

■ For more information, please refer to the MSDS for the product.

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Antiviral test : COVID-19

◯ Sample submission: November 4, 2020 / Response date: December 28, 2020
◯ Client: Presence, Inc.
◯ Test item: Antiviral activity test
◯ Test method: ISO21702 / Measurement of antiviral activity on plastics and other non-porous surfaces
◯ Test organization: QTEC, Japan Textile Products Quality Technology Center, Kobe Testing Center,
Microorganism Testing Laboratory

【 Test Summary 】

◯ Test virus: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) / NIID isolate:
JPN/TY!WK-521 (distributed by the National Institute of Infectious Diseases)
・Host cell：VeroE6/TMPRSS2 JCRB1819
・Cytoplasmic drop : Dulbecco’ s modified Eagle’ s medium (low-glucose) ; DMEM
(SIGMA, Cat#D6046) Minimum Essential Medium Eagle ; EMEM (SIGMA, Cat#-M4655)
・Fetal Bovine Serum : Fetal Bovine Serum (FBS) (SIGMA, Cat#I 73012)
・Sealing film: Polyethylene film
・Control sample : GlossWell #360 Type Anti-Viral (Unprocessed products)
・Test sample : GlossWell #360 Type Anti-Viral (Processed products)
・Purification of test specimen: Not performed
・Inoculation of test virus suspension: 0.4ml
・Test condition: Action temperature: 25℃
・Test condition: Action time: 24 hours
- The virus infection titer was also measured immediately after inoculation for the control sample.
・Washing solution: SCDLP diluted 10 times in DMEM containing 2% FBS
・Infection titer measurement method: Plaque measurement met

【 Test Operation 】

1) Main Test :

1. Infect host cells with the virus, add EMEM and incubate at 37° C for a predetermined period of time, then centrifuge at 4° C, l,000xg for 15 minutes, and the supernatant is used as the test virus suspension.
2. Dilute the virus suspension obtained in 1. 10-fold with sterile distilled water to 1 ~sx101 PFU/mL, and use this as the test virus suspension.
3. Place each specimen (50 mm x 50 mm) on the bottom of a sterile Petri dish with the processed side up, and inoculate with 0.4 ml of the test virus suspension.
4. Cover the petri dish with an adhesive film (40 mm x 40 mm) and press down lightly so that the test virus suspension is spread over the entire film.
5. Cover the petri dish with the lid.
6. After dying at 25° C for 24 hours at 90%RH or higher, add 10 mL of washing-up liquid to each test sample.
7. Scrub the surface of each test specimen and the dense cling film to wash out the virus.
8. Dilute the washout solution 10-fold using DMEM containing 2% FBS.
9. Determine the viral infection titer by the plaque measurement method.

2) Host cell verification test :

2)-1 Cytotoxicity Confirmation

1. Add l0mL of washing-up liquid to each test sample, and perform the washing-up procedure as in the main test.
2. Make a 10-fold dilution of the washout solution using DMEM containing 2% FBS.
3. Stain the cells as in the plaque measurement method to check for cytotoxicity.

2)-2 Susceptibility testing of cells to viruses

1. Add 10mL of washing-up liquid to each test sample and perform the washing-up procedure as in the main test.
2. Dilute the washout solution 10-fold using DMEM containing 2% FBS.
3. Take 5 mL of the solution in 2. above into a sterile test tube.
4. Prepare a test virus suspension at 4~6×104 PFU/ml using EMEM,
   and add 0.05 ml of the suspension to the washout solution in 2.
5. Allow to stand at 25° C for 30 minutes.
6. Measure the virus infection titer by the plaque measurement method and confirm the susceptibility of the cells to the virus by measuring the virus infection titer per ml of washout solution.

【 Test Results 】

1) Main Test :

・Test virus: SARS-CoV-2 NIID isolate; JPN/TY!WK-521 (distributed by the National Institute of Infectious Diseases)

・Test virus suspension concentration: 1.2 x 107 PFU/ml

Specimen		Virus infection titer (PFU/cm2) (Note 2) logarithmic function			Antiviral activity value【R】(Note 2)
		logarithmic function		log-average normalized value	
GlossWell #360 Type Anti-Viral (Unprocessed) (Note 1)	Immediately after inoculation【U0】	n1	5.52	5.53	
		n2	5.52		
		n3	5.55		
	After leaving for 24 hours【Ut】	n1	5.04	5.04	
		n2	5.03		
		n3	5.06		
GlossWell #360 Type Anti-Viral (Processed product)	After leaving for 24 hours【At】	n1	<1.80	<1.80	≧3.2 [Numeric Description]
		n2	<1.80		
		n3	<1.80		

★ The antiviral activity value ≧3.2 means that the antiviral activity value after 24 hours is 99.9% or more than 1/1000.

※ The antiviral activity value that is considered acceptable by ISO 21072 is ≧2.0, so the results of this test far exceed the acceptable value.

(Note 1) : GlossWell #360 Type Anti-Viral (unprocessed) (provided by the client) was used as a control sample.

(Note 2) PFU : plaque forming units.

(Note 3) Antiviral activity value R= Ut -At

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2) Host cell verification test :

・Test virus: SARS-CoV-2 NIID isolate; JPN/TY/WK-521 (distributed by the National Institute of Infectious Diseases)

・Test virus suspension concentration: 4.9 x 104PFU/ml

Specimen	2) -1 Presence of cytotoxicity	2) -2 Confirmation of cell susceptibility to the virus. Virus infection titer (PFU/ml) (Note 2) Logarithmic mean value for normal use		Determination of test validity
GlossWell #360 Type Anti-Viral (Unprocessed) (Note 1)	non-	【Su】	2.68	establishment
GlossWell #360 Type Anti-Viral (Processed product)	non-	【Su】	2.69	establishment
Negative control (Note 4)	non-	【Sn】	2.67	

Note 4) A solution of SCDLPs diluted 10-fold in DMEM containing 2% FBS was used as a negative control.

Conditions for completion of the test

2-1) Cytotoxicity: None

2-2) Confirmation of cell susceptibility to the virus: | Sn – Su | ≤ 0.5 and | Sn – S1 | ≤ 0.5

【Reference Information】

◯ Real-time RT-PCR measurement of virus suspensions subjected to this test.

・Test virus: SARS-CoV-2NIID isolate; JPN/TY/WK.-521 (distributed by the National Institute of Infectious Diseases)

・Virus suspension wastiness: >lOSPFU/ml

・Real-time PCR equipment: Thermal Cycler Dice Real Time SysteM 3 (TaKaRa)

・Detection Kit: SARS-CoV-2Detection Kit -Nl set- (Code NCV-301; Lot# 038200)

(TOYOBO CO.,LTD. Biotech support Department)

◯ Measurement results

The amplification of viral RNA was confirmed by the real-time RT-PCR measurement results (Fig. l).

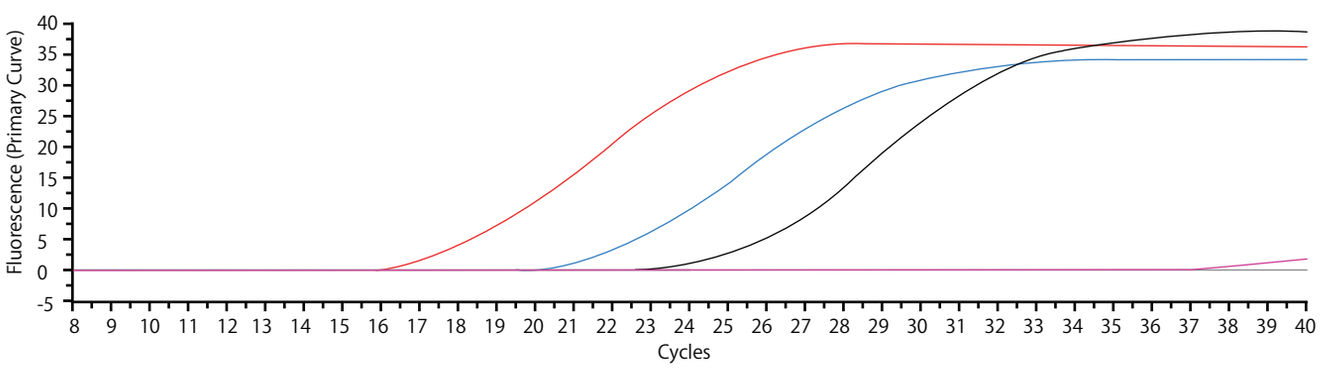

Fig.l. Real-time RT-PCR measurement results of virus suspension

- Graph: red line (102-fold dilution of viral suspension flooding in PBS)
- Graph: Blue line (103-fold dilution of virus suspension wastage in PBS)
- Graph: black line (104-fold dilution of virus suspension wastage in PBS)
- Graph: pink line (Negative control; EMEM)

Testing organization: Microbiological Testing Laboratory, Kobe Testing Center, Japan Textile Quality Technology Center

Antiviral test: Influenza type A virus (with an envelope membrane)

◯ Sample : April 2, 2020 / Reply date : June 5, 2020

◯ Test item : Antiviral test

◯ Test details : Evaluate the antiviral properties of polycarbonate sheets

◯ Test method : ISO21702

「Measurement of antiviral activity on plastics and other non-porous surfaces」

[Test Outline]

・Test virus: Type A influenza virus(H3N2)

A/Hong Kong/8/68; TC adapted ATCC VR-1679

・Host cell : MDCK cells (canine kidney-derived cells)

・Test sample : ① GlossWell #360 Type Anti-Viral / polycarbonate sheet (unprocessed)

(control : samples submitted by the requester)

② GlossWell #360 Type Anti-Viral / Polycarbonate Board (Processed)

・Washing solution : SCDLP medium

・Placement condition : Placement temperature 25℃.

Placement time 24 hours （①GlossWell #360 Type Anti-Viral polycarbonate sheet (unprocessed) was measured immediately afterwards）

・Sample size : 5 cm x 5 cm

・Adhesion film: Polyethylene (4cm x 4cm)

・Volume of test virus suspension: 0.4 mL

・Specimen cleanliness : not performed.

[Test operation]

1) Main test：

1. Infect host cells with the virus and culture them, and remove the cell remnants by centrifugation to make a virus suspension.

2. The virus suspension obtained in 1. is diluted 10 times with sterile distilled water to a concentration of 1-5X107 PFU/mL to make a test virus suspension.

3. Place each specimen on the bottom of a sterile petri dish with the processed side up and inoculate it with 0.4 mL of the test virus suspension.

4. Cover the adhesion film and press down lightly so that the test virus suspension is spread over the entire film.

5. Cover the top of a petri dish.

6. After standing at 25°C for 24 hours, add 10 mL of the washout solution to each test specimen.

7. Scrape the surface of each test specimen and the adhesive film to wash out the virus.

8. Determine the viral titer by the plaque assay.

2) Host cell verification test.

2)-1 Cytotoxicity Confirmation Test

1. Add 10mL of washout solution to each test specimen, and perform the washout procedure as in this test.
2. Stain the cells in the same way as the plaque assay, and confirm the presence of cytotoxicity.

2)-2 Test to confirm the susceptibility of cells to viruses

1. Add 10mL of washing-up liquid to each test specimen, and perform washing-up operation as in this test.
2. Take 5mL of the above washout solution into a sterile test tube.
3. Prepare 4-6 X 104 PFU/mL of the test virus suspension.
   Prepare 4-6 X 104 PFU/mL test virus suspension, and add 0.05 mL of the suspension to the washout solution.
4. Incubate at 25°C for 30 minutes. 5.
5. Confirm the susceptibility of the cells to the virus by measuring the viral titer of infection by the plaque assay.

[Test results]

1) Main test

・Test virus: Influenza A virus (H3N2) | A/Hong Kong/8/68;TC adapted ATCC VR-1679

・Test virus suspension concentration: 3.5x107 PFU/ml

Sample	Viral infection titer (PFU/cm2) (Note 2) logarithmic mean		Test Results : Antiviral activity value [R] (Note 3)
①GlossWell #360 Type Anti-Viral polycarbonate sheet (unprocessed) (Note 1)	Immediately after inoculation [U_0]	5.77	–
	After leaving it for 24 hours [U t]	5.41	
②GlossWell #360 Type Anti-Viral / Polycarbonate Board (fabricated)	After leaving it for 24 hours [A t]	< 0.80	≧4.6 [Numerical explanation]

[Numeric explanation] : Antiviral activity value ≥ 4.6

= This indicates an antiviral activity value of at least 99.99% or 1/10000 (4th power of 10).

(Note 1) GlossWell #360 Type Anti-Viral / polycarbonate plate (unprocessed) as a control sample - (control : sample submitted by the client).

(Note 2) PFU : plaque forming units

(Note 3) Antiviral activity value R = U t -A t

2) Host cell verification test

・Test virus: Type A influenza viru (H3N2)

A/Hong Kong/8/68;TC adapted ATCC VR-1679

・Test virus suspension concentration : 4.0×10^4 PFU/mL

Specimen	2)-1 Cytotoxicity	2)-2 Confirmation of cell susceptibility to viruses Viral infection titer (PFU/mL) (Note 2) logarithmic mean	Determination of test success
① GlossWell #360 Type Anti-Viral / Polycarbonate sheet (unprocessed)	non	[S_U] 2.43	Establishment
② GlossWell #360 Type Anti-Viral / Polycarbonate Board (Processed)	non	[S_T] 2.48	Establishment
Negative control (Note 4)	non	[S_n] 2.60	

(Note 4) SCDLP medium was used as a negative control.

[Test existence conditions]

2-1) Cytotoxicity : None

2-2) Confirmation of cell susceptibility to virus: $|S_n - S_u| \leq 0.5$ and $|S_n - S_t| \leq 0.5$

◯ Testing organization :

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Antiviral test: feline calicivirus (without envelope)

[Exam summary]

- Test virus: Feline calicvirus; Strain: F-9 ATCC VR-782
- Host cells: CRFK cells (cat kidney-derived cells)
- Test sample: ① Paint GlossWell # 360 Type Anti-Viral / ② Glass plate
- Washing solution: SCDLP medium supplemented with Fetal Bovine Serum to a final concentration of 10%
- Adhesive film: polyethylene (4cm × 4cm)

Norovirus is rare for cell culture, so it is not possible to test, measure and evaluate the effect of various disinfectants or individual concentrations. For that reason, caliciviruses and mouse norovirus, which are closely related, are our testing, measuring and evaluating the disinfecting effect of general disinfectants.

[Test method]

1) Main test

1. Prepare the test virus suspension.
2. Place the sterilizing agent filter paper on the bottom of the sterile petri dish, add 4.5 mL of sterile ion-exchanged water, place a U-shaped glass tube so that the test piece does not touch the filter paper for humidity control, and place a processing surface on it. Place the test sample on top.
3. Inoculate 0.4 mL of the test virus suspension into each sample.
4. Cover with the adhesive film and press gently so that the test virus suspension spreads over the entire film.
5. Cover the Petri dish.
6. After leaving at ℃ 25 ℃ for 24 hours put the specimen into the sterilizer stomacher bag, and wash out the virus from the specimen by adding 10mL of washing solution.
7. Measure the virus infectivity by the plaque assay.

2) Host cell verification test:

2) -1 Cytotoxicity confirmation test

1. Put the sample in a sterilizer stomacher bag, add 10 mL of the washing solution, and perform the washing operation in the same manner as in this test.
2. Incubate at room temperature for 30 minutes.
2. Stain the cells in the same manner as in the plaque assay and check for cytotoxicity.

2) -2 Confirmation test of cell susceptibility to -2 virus

1. Put the sample in a sterilizer stomacher bag, add 10 mL of the washing solution, and perform the washing operation in the same manner as in this test.
2. Transfer 5 mL of the above washing solution to a sterilized test tube.
3. Prepare the test virus suspension at 5 x 104 PFU / mL, and add 0.05 mL of the suspension to the washing

solution in step 2.

4. Leave at room temperature for 30 minutes.

5. Measure the virus infectivity by the -plaque assay to confirm the sensitivity of the cells to the virus.

[Test result]

1) Main test

Test virus suspension: Feline calicvirus 1.0 x 107 PFU / ml

Specimen	Virus infection titer (PFU / mL) (Note 2) Common logarithmic mean	
Glass plate (Note 1)	Immediately after inoculation	6.47
	After leaving for 24 hours	4.11
GlossWell # 360 Type Anti-Viral painted piece	After leaving for 24 hours	＞2.00 [Explanation of the values]

[Explanation of the values] :

Antiviral activity value >2: Indicates an antiviral activity value of 99% or 1/100 or higher.

2) Host cell verification test:

Sample	2) -1 Cytotoxicity	2) -2 Confirmation of cell susceptibility to virus
		Viral infection titer (PFU/mL) (Note 2) Logarithmic mean of normal use
Glass plate (Note 1)	None	2.44
GlossWell # 360 Type Anti-Viral Paint piece	None	2.41

(Note 1) ① A glass plate was used as a control sample.

(Note 2) PFU: plaque forming units

2)-1

From the results of the cytotoxicity confirmation test, no cytotoxicity was confirmed in any of the samples. In addition, from the results of the test for confirming the sensitivity of the cells to 2) -2 virus, no remarkable decrease in the sensitivity of the cells to the virus was observed in any of the samples.

◯ Testing organization :

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Antibacterial test / Pseudomonas aeruginosa

[Test method]

* Antibacterial test JIS Z 2801 (Film adhesion method)

- Test strain: Pseudomonas aeruginosa NBRC3080
- Bacterial solution adjustment solution: 1 / 500NB medium
- Test bacterial solution inoculation volume: 0.4ml
- Unprocessed sample: polyethylene film

[Test results]

Test sample	Number of visible bacteria Log average		Antibacterial activity value [R] (Note 2)
Unprocessed specimen (Note 1)	Immediately after inoculation	[U_0] 3.87	–
	After culturing for 24 hours	[U_t] 5.56	
GlossWell # 360 Type Anti-Viral painted piece	After culturing for 24 hours	[A_t] -0.20	≧5.8 [Explanation of the values]

[Explanation of the values] :

Antimicrobial activity value ≧5.8: Indicates an antimicrobial activity value of 99.999% or 1/100000 or higher

(Note 1) A polyethylene film was used as a non-processed test piece.

(Note 2) Antibacterial activity value R = Ut-At

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Antibacterial test / Escherichia coli（O157：H7）

[Test method]

* Antibacterial test JIS Z 2801 (Film adhesion method)

-Test strain: Escherichia coli (serotype II O157: H7, verotoxin type I and type II producing strains)

- Escherichia coil RIMD 0509952
- Bacterial solution adjustment solution: 1 / 500NB medium
- Test bacterial solution inoculation volume: 0.4ml
- Unprocessed sample: polyethylene film

[Test results]

Test sample	Number of viable bacteria Log average		Antibacterial activity value 【*R*】 (Note 2)
Unprocessed specimen (Note 1)	Immediately after vaccination	[U_0] 3.89	—
	After culturing for 24 hours	[U_t] 4.77	
GlossWell # 360 Type Anti-Viral painted piece	After culturing for 24 hours	[A_t] ＜-0.20	≧5.0 [Explanation of the values]

[Explanation of the values] :

Antimicrobial activity value ≧5.0: Indicates an antimicrobial activity value of 99.999% or 1/100000 or higher.

(Note 1) ① A polyethylene film was used as a non-processed test piece.

(Note 2) Antibacterial activity value R = Ut-At

◯ Testing organization :

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Antifungal test / Black mold

[Test method]

* Antibacterial test JIS Z 2801 (Film adhesion method)

- Test strain: Cladosporium cladosporioides NBRC6348 (Black mold)
- Measurement method: Luminescence measurement method
- Spore suspension preparation solution: 1/20 SDB medium
- Spore suspension inoculation volume: 0.4ml
- Mold spore concentration: 1.0 × 105spores / ml
- Culture conditions: 25 ° C, 95% RH, 42 hours
- Unprocessed sample: polyethylene film

[Test results]

Test sample	ATP amount Common logarithmic mean		Growth value 【F】 (Note 2)	
Unprocessed test piece	Immediately after inoculation	[F_a] -11.95	2.4	Antifungal activity 【FS】 (Note 1)
	After 42 hours of culture	[F_b] -9.58		
GlossWell # 360 Type Anti-Viral painted piece	Immediately after inoculation	[F_o] -13.59	-	≧2.7 [Explanation of the values]
	After 42 hours of culture	[F_c] -13.91		

[Explanation of the values] :

Anti-mold activity value ≧2.7: Anti-mold Indicates that the activity value is greater than 99% or 1/100.

(Note 1) Antifungal activity value [FS] = (Fb-Fa) – (Fc-Fo)　(* 2) Growth value [F] = Fb-Fa

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