



Distributed exclusively by Divine in Europe



Background

COVID-19 has been and remains a serious threat to human health and life.
Viral transmission on touch surface materials is most effectively prevented by copper

- K COPPER PLUS Antimicrobial copper film continuously prevents the spread of COVID -19 in the background
- Wherever human error can occur the K COPPER PLUS will carry on working seamlessly as life insurance
- K COPPER PLUS kills SARS CoV-2 in addition to E. coli and a wide range of food and hygiene related bacteria
- K COPPER PLUS film – a retrofit product designed to add anti-microbial hygiene protection to premises, equipment, furniture, all surfaces and food handling processes



What is Antimicrobial Copper?



Antimicrobial copper is copper or copper alloy containing more than 60% copper.

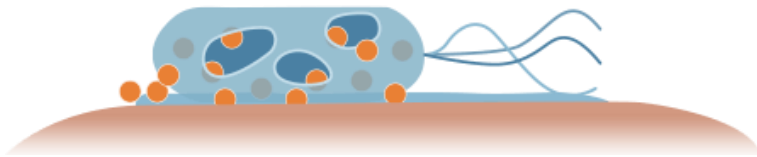


It is the strongest non-toxic natural antimicrobial material that acts on bacteria and viruses such as E. coli and food poisoning bacteria.

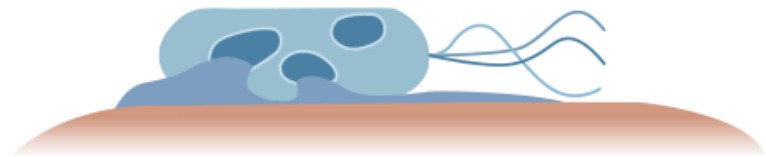
International Copper Association

- The ICA is an international non-profit organization founded in 1960 to pioneer the copper market and develop related technologies.
- Major copper producers, copper and copper alloy manufacturers, and power cable companies around the world are participating as members of the ICA. These members account for 80% of global refined copper production.
- The ICA has its head office in New York, U.S. and regional headquarters in Brussels, Santiago and Singapore. It is operating research programs on the relationship between copper and environment/health in more than 50 nations.
- The ICA developed the Cu+® brand to inform excellence of antimicrobial copper to consumers. The international Cu+ certification mark is attached to copper or copper alloy (with copper content of 60% or above) products that show certain antimicrobial effect within two hours.
- Copper products with the Cu+ brand mark can be used safely because their antimicrobial effects have been certified.

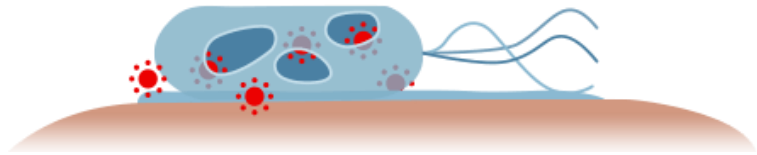
Antimicrobial activity



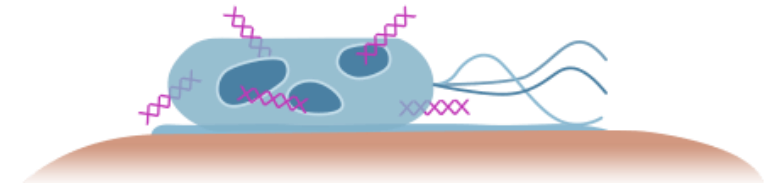
A Copper dissolves from the copper surface and cause cell damage.



B The cell membrane ruptures because of Copper and other stress phenomena, leading to loss of membrane potential and cytoplasmic content.



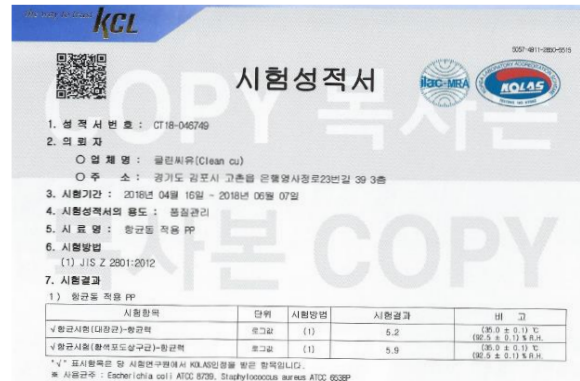
C Copper ions induce the generation of reactive oxygen species, which cause further cell damage.



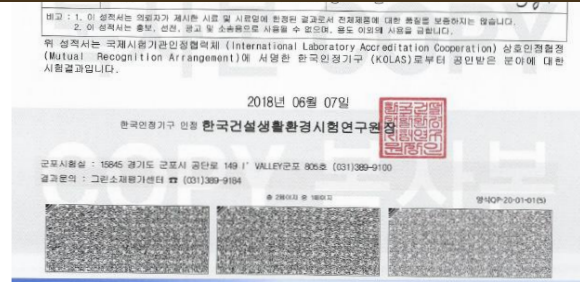
D Genomic and plasmid DNA becomes degraded.

Our antimicrobial copper film killed 99.999% of E. coli within 24 hours

Our antimicrobial copper plastics have a strong anti-bacterial effect. On June 7, 2018, KOLAS(Korea Laboratory Accreditation Scheme) scientifically revealed that our antimicrobial copper plastics killed 99.999% of E. coli and Staphylococcus aureus (food poisoning bacteria) in 24 hours.



Our antimicrobial copper plastics killed 99.999% of E. coli, and Staphylococcus aureus (Food poisoning bacteria) in 24 hours



Strains used: E. coli, Staphylococcus aureus (food poisoning bacteria)
(6 strains-Salmonella / pneumococcal / MRSA / E. coli / Staphylococcus aureus / Pseudomonas aeruginosa most frequently causing disease)

The Wider Benefits- Keep your business fit for a fast changing World

By using our antimicrobial copper plastic Film on high frequency touch surfaces and in producing Food containers the following beneficial effects can be expected.



Reducing risk of
infection to all parties



Industry
leading effect



Improving health
standards



Marketing
benefits



Product liability
reduction

1. Both Staff and Consumers face substantially reduced risk of infection
2. Significant hygiene benefits to the global food manufacturing and distribution industry
3. Advancing national health standards through improved food hygiene
4. Improved corporate image and brand marketing from greater safety & protection
5. Increased protection against liability claims

History of Antimicrobial Copper Plastic

Antimicrobial Copper

- 1994 The University of Southampton demonstrated antimicrobial property of copper and copper alloy against Legionella pneumophila.
- 2000 Antimicrobial property of copper and copper alloy against Escherichia coli was demonstrated.
- 2006 Antimicrobial property of copper and copper alloy against Methicillin-resistant Staphylococcus aureus (MRSA) was demonstrated.
- 2007 Antimicrobial property of copper and copper alloy against C. difficile was demonstrated.
- 2007 Antimicrobial property of copper and copper alloy against influenza A (H1N1) was demonstrated.
- 2007 About 300 alloys were registered by the U.S. EPA.
- 2009 Antimicrobial property of copper and copper alloy against VRE was demonstrated.
- 2011 Asan Medical Center in South Korea conducted a laboratory research on MRSA and VRE.
- 2012 Eradication of MRSH was demonstrated.
- 2013 Eradication of norovirus was demonstrated.
- 2014 Suppression of avian influenza (AI) was demonstrated.
- 2015 Inactivation of MERS virus was demonstrated.
- 2020 Inactivation of SARS CoV-2 **COVID - 19** spread was demonstrated

Antimicrobial Copper Test Pathogen

Acinetobacter baumannii
Adenovirus
Aspergillus niger
Candida albicans
Campylobacter jejuni
Clostridium difficile
Enterobacter aerogenes
Escherichia coli O157:H7
Helicobacter Pylori
Influenza A (H1N1)
Legionella pneumophila
Listeria monocytogenes
Klebsiella pneumoniae
MRSA
Mycobacterium tuberculosis
Poliovirus
Pseudomonas aeruginosa
Salmonella enteritidis
Staphylococcus aureus
Tubercle bacillus
Vancomycin-resistant enterococcus (VRE)

+many more

Antimicrobial activity (Comparison of antimicrobial activity by base surface material)

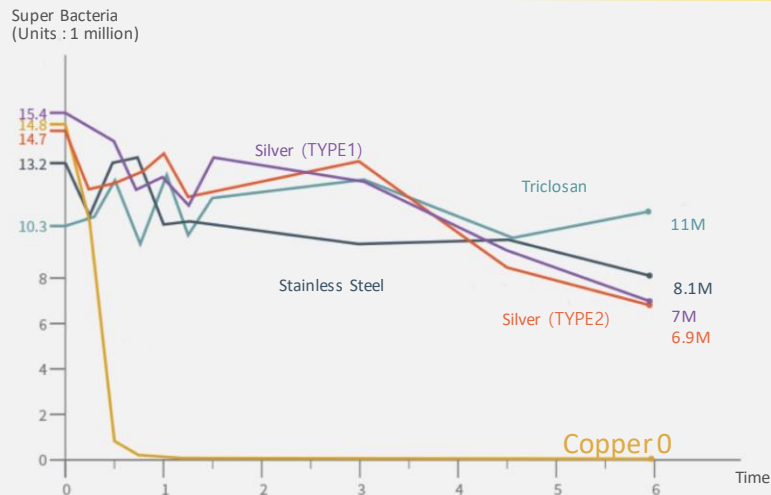


Copper (Cu) is the most traditional antimicrobial material used throughout time

Copper has been used to sterilize drinking water and treat patients in ancient Egypt, and has been found to contribute to the prevention of food poisoning by being used as an ingredient in 19th century tableware.

Comparison of antibacterial performance on representative inorganic materials

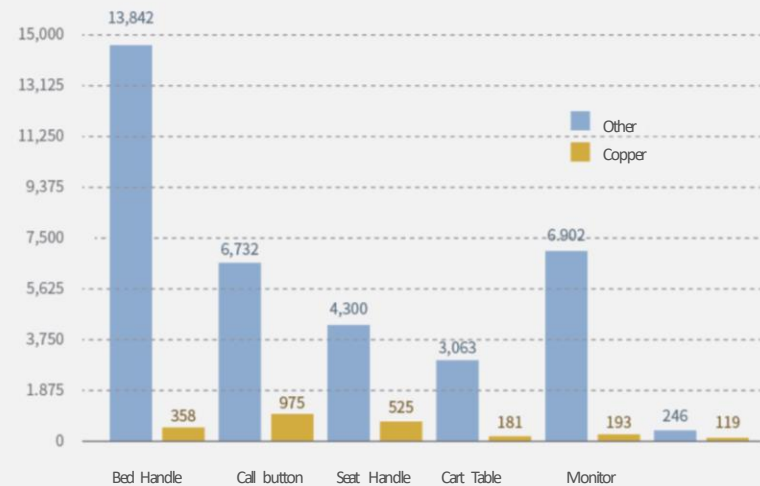
99.9% antibacterial activity within 2 hours in copper only (over 90% dissipation within 30 minutes)



Source: International Copper Alliance, 2010

[US hospital test results]

More than 90% reduction in pathogens/bacteria on the surface of copper products
Super bacteria MRSA and VRE are not detected at all



Source: Salgado et al, Poster Presentation, 5th Decennial International Conference on Hospital Acquired Infections, 2010

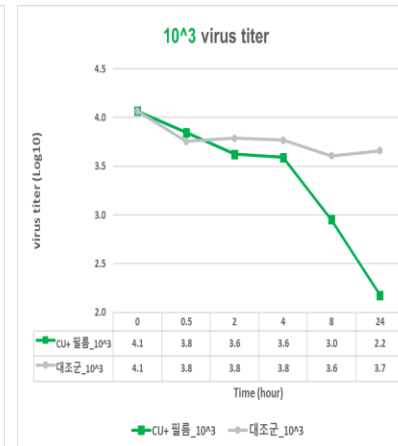
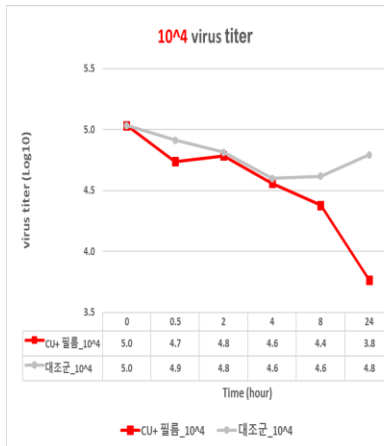
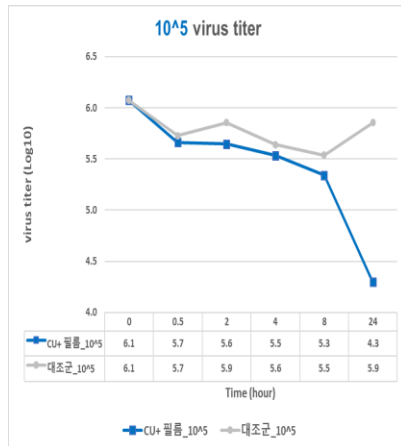
Virus inactivation using SARS-CoV-2 on K COPPER PLUS film

K COPPER PLUS significantly prevents the spread of COVID-19 disease

Korea University School of Medicine Biosafety Center Research Results (May 15, 2020)
It has been scientifically proven to reduce the COVID-19 virus by 97.2%

Analysis of virus inactivation performance of antimicrobial film compared to control group

Even after experimenting with a large amount of covid-19 virus, the result is nearly 100% eradication.



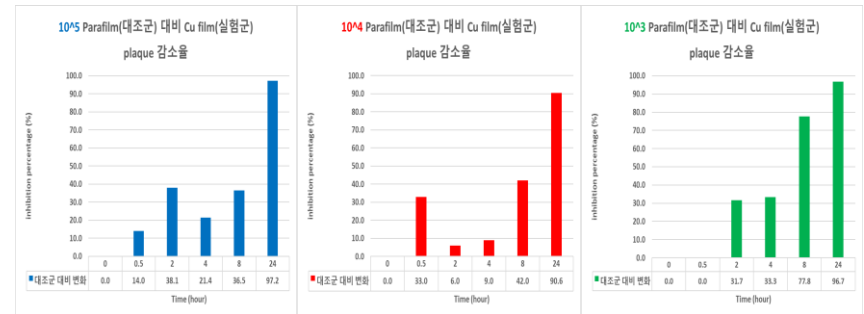
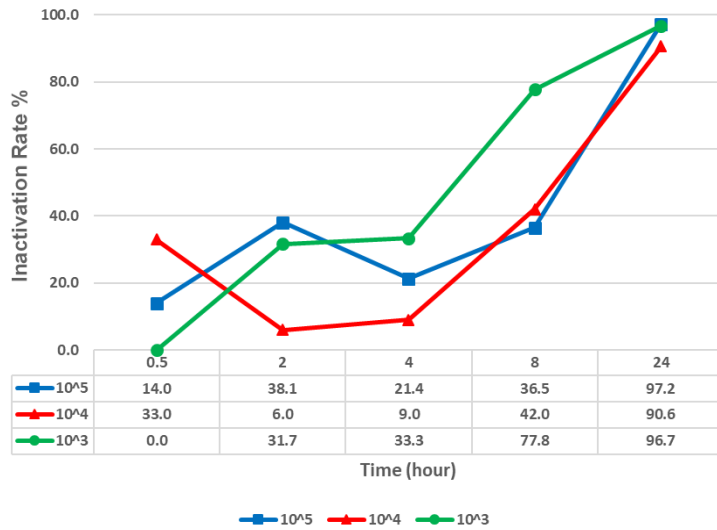
Using SARS-CoV-2 virus in May 2020 Laboratory results show a 97.2% kill in 24 hours

K COPPER PLUS significantly prevents the spread of COVID-19 disease

Korea University School of Medicine Biosafety Center Research Results (May 15, 2020)
It has been scientifically proven to reduce the COVID-19 virus by 97.2%

Virus infectivity analysis

The infectivity rate was significantly reduced compared to the control group resulting in a 97.2% reduction in infectivity.



Korean Biosafety Center & Korean Center for Disease Control & Prevention

Results from tests conducted to evaluate the anti-virus function of Clean CU K-COPPER PLUS Film against the COVID-19 virus
15/05/2020

Objective – Evaluation of the function by Clean CU K-COPPER PLUS to deactivate the severe acute respiratory syndrome -coronavirus-2 (SARS-CoV-2) known to cause COVID - 19

Full tests Conducted by The Biological Safety Center BSL-3, Korean Center for Disease Control No KCDC-18-03-02

Lead Researcher - Professor Man-Seong Park

Professor Man-Seong Park is President of the Biological Safety Center and Microbiology Department – Korea University Medical School

Joint Researchers - Korea Research Institute for Viral Diseases - Junyong Bae, Kyeongryeol Shin, Chungwang Choi

Test materials and methods

Clean CU K-COPPER PLUS Film in 4 cm x 4 cm squares is infected with COVID-19 virus (SARS-CoV-2): nCoV/Korea/KUMC-01/2020 at three test levels:

- 10^5 (100,000) virus', diluted to PBS at viral load 1×10^5 PFU/100ul
- 10^4 (10,000) virus' diluted to PBS at viral load 1×10^4 PFU/100ul
- 10^3 (1,000) virus' diluted to PBS at viral load 1×10^3 PFU/100ul

all carried out utilising a cell line -Vero: Monkey kidney - Source Working Cell Bank (WCB).

Test Method

Each of the virus solutions was evenly applied to the individual 4x4 cm squares of CleanCU film at room temperature to enable the virus to react with the film for 5 different set periods –0.5 hrs, 2 hrs, 4 hrs, 8 hrs and 24 hrs

After the specific reaction time each of the film squares is then removed to a PBS solution for 30 seconds of vortexing in order to have the virus come out into the solution. The solution is then diluted to $1/10^{\text{th}}$ of the original concentration and is infected with the Vero cell line.

Measurement of the virus quantity – Plaque Assay Test

After incubating at 37deg C in 5% CO2 the plaque generated is then counted to quantify the number of viruses that are still a live.


After measurement of the virus load in each sample in the respective time groups they are then compared to each the control groups for the corresponding time and infection loading to evaluate the ability of the CleanCU film to deactivate the COVID-19 virus.

Conclusion:

When CleanCU K-COPPERPLUS Film was infected with 100,000, 10,000 and 1,000 viruses for 24 hours the deactivation of the virus compared to the control group was 97.2%, 90.6% and 96.7% respectively.

In conclusion therefore the CleanCU K-COPPER PLUS film which contains over 60% copper has the ability to prevent infection by SARS – CoV-2 which causes COVID-19.

Test Report



고려대학교
KOREA UNIVERSITY

(02841) 73 Korea University Road, Seongbuk-Gu, Seoul, Korea TEL (02)2286-1312
 Test Report Number : KUMC-MP-03 Initiation date : April 25, 2020
 Client : CleanCU Completion date : May 15, 2020
 Representative for Client : 이경민
 Address for Client : 경기도 김포시 고촌읍 테리로 179번길 85

CleanCu's 'K Copper Plus' film contains copper and has the ability to prevent infection by SARS-CoV-2, which causes COVID-19. Using CleanCU's K Copper Plus film in areas where COVID-19 is prevalent will help prevent the spread of the disease.

※ Verification of Virus inactivating Ability

Test Substance Name :
 Evaluation of Inactivation of COVID-19 virus treated by CleanCU 'K Copper Plus' film

Test Result				
Test	Inactivation rate	Test Time	Result	Test Method
Inactivation test against COVID-19 virus	Inactivation rate (%) as compared to control	30 min	14.0%	Plaque assay
		2hours	38.1%	
		4hours	21.4%	
		8hours	36.5%	
		24hours	97.2%	

※ Condition for test
 - Virus titer : 1×10^6 PFU
 - Test time : 30 minute, 2 hours, 4 hours, 8 hours, 24 hours
 - Test temperature : $(20 \pm 2) ^\circ\text{C}$

※ Virus for test
 - COVID-19 virus: SARS-CoV-2(nCoV-19/Korea/KUMC-01/2020)


※ Cell line for test
 - Vero (Monkey kidney cell line)

Date of Issue : May 15, 2020

Reporter: Kyeong Ryeol Shin (Signature)
 (Tel: 02-2286-1309)

Principal Investigator
 Prof. Man-Seong Park (Signature)
 Department of Microbiology, Korea University College of Medicine

Testing Institution
 Korea University College of Medicine, Research and Business Foundation
 (Biosafety Center / Korea Centers for Disease Control and Prevention approval number : KCDC-18-03-02)



(Signature)

Advantage of Antimicrobial Copper Plastic

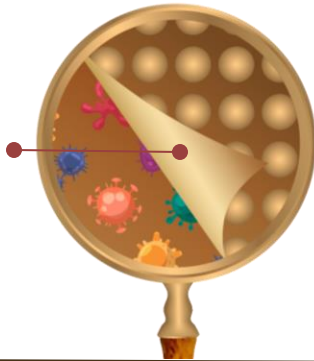
K COPPER PLUS is not a coating, the copper is integral to its structure
All of its ingredients are antimicrobial.

Produced by a patented method of compressing the fabric after adding antibacterial copper to the resin of the film.

Our film is not just a surface coating

Do not use single layer antimicrobial coatings

Simple 1 layer
of coating



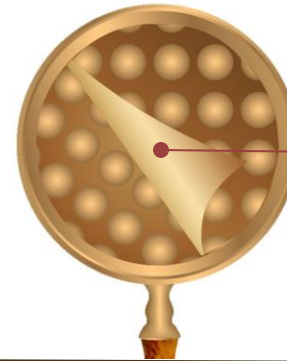
With just surface coating the Antimicrobial capabilities are lost once the coating is damaged.
In addition you lose the antimicrobial effect when cleaned with disinfectants.

Not Semi-persistent

K COPPER PLUS is impregnated with copper throughout

Even distribution of copper in the film is critical

Even
distribution
of copper



Antimicrobial function in the film.

Disinfectants can be used to clean.

Semi-persistent functionality

Advantage to food and packaging from use of Antimicrobial Copper Plastic

K COPPER PLUS is certified as suitable material for food containers.



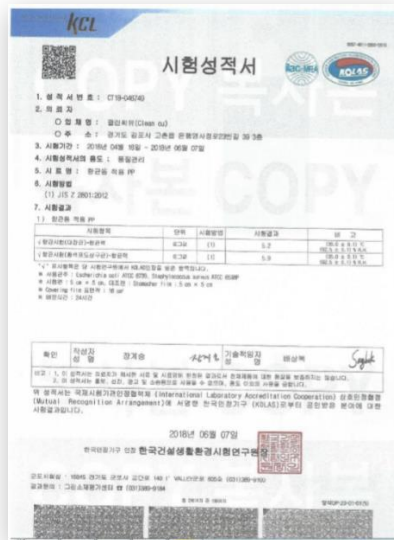
FDA food contact container standards
2019.2.14 / USA / JK Bio science



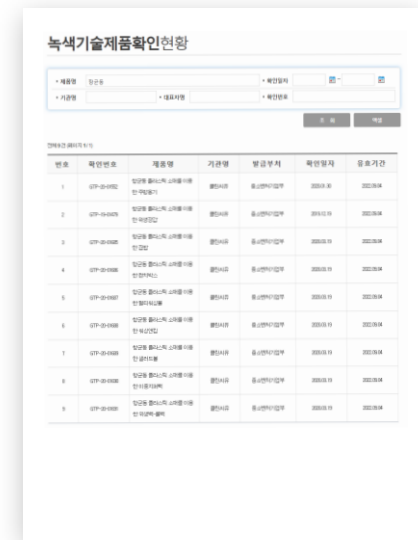
Scanned with CamScanner



Evidence of antimicrobial activity against various bacteria
2018-2020 / Korea / Korea Certification Agency



Under the Basic Act on Low Carbon Green Growth,
Certified as a green technology product
2020.3.19 / Korea / Small & Medium Venture Business Department



Formats and Applications of K COPPER PLUS Products

Specification			Specification			Specification		
Product	Type	Size(mm)	Product	Type	Size(mm)	Product	Type	Size(mm)
Film (No Adhesive)	Sheet	400x1000	TPU (No Adhesive)	Sheet	400x1000	Tube	Roll	15ø (45x1000)
		1000x1000			1000x1000			
		A4(Pkg)			A4(Pkg)			25ø (45x1000)
		A4(Bulk)			A4(Bulk)			
Roll	400x30000	Roll	1000x100000	40ø (45x1000)				
Film (With Adhesive)	Sheet	400x500	TPU (With Adhesive)		Sheet			400x1000
		400x1000		1000x1000				
		1000x1000		A4(Pkg)				
		A4(Pkg)		A4(Bulk)				
Desk Mat (Non slip pad)	Sheet	400x600	Roll	1000x100000				

Shelving – Racking – Trolley & Basket handles – Touch Screen devices – Food packaging – Plastic bags – All Toilet area surfaces – Toilet seats – Food preparation areas - Door handles – Fridge & Freezer handles – ATM’s -

Global trend of antimicrobial plastic products



Car door



ATM



Metro handle



Trolley and Delivery Trolley handling



7Eleven fridge handle



7Eleven Touch Screen



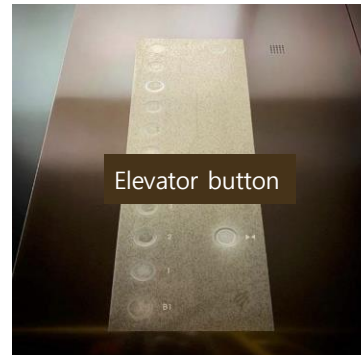
Payment Stations

Applications of antimicrobial plastic products

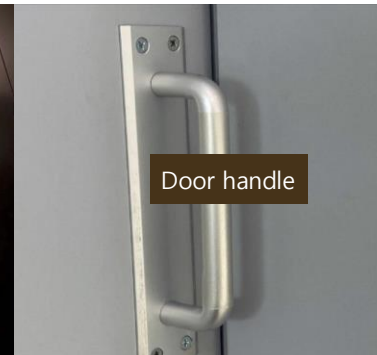
Antimicrobial Film



Antimicrobial copper film that adheres to all areas of contact



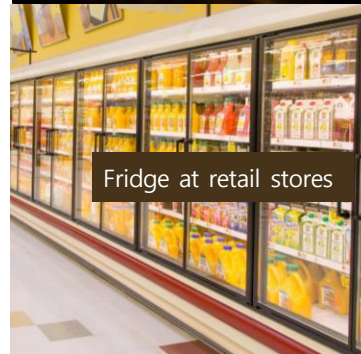
Elevator button



Door handle



Keyboard



Fridge at retail stores



Menu



Desk Pad

Industry	Facility Type	Applied Product
Medical	Hospital, Public Health facility, Retirement home	Medical equipment and supplies, Bed
Education	All schools and educational facilities	Tables and Chairs
Public Institution	Bank, Public office, Police Station, Court	Tables and Desks, ATM
Transportation	Bus, Taxi, Metro, Train, Private cars	Escalator, Handle bars
F&B / Logistics	Restaurant, Café, Mart	Tray, Cart, Kiosk
Residential	Apartments / Residential facilities	Elevator, Remote controller
Others	Church, Cyber Café, Library	Tables and Chairs

Other applications of antimicrobial plastic products



Other applications of antimicrobial plastic products

Antimicrobial copper hygiene bag



Antimicrobial copper hygiene gloves



Antimicrobial copper double zipper bag





Thank you



Robert Barr

Chairman - Divine Internet Group

Rbarr@divineinternet.com

+44 773 820 8896

