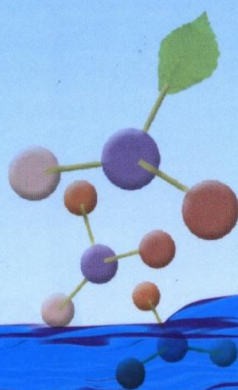


# LUMITITAN-NAG

Photocatalyst aqueous interior paint

Titanium Dioxide + Apatite + Silver Nanoparticles  
= High-performance photocatalyst interior paint



**sasamic**

★ Certified as a Rank-A company by Kyoto City Venture Business Evaluation Committee ★

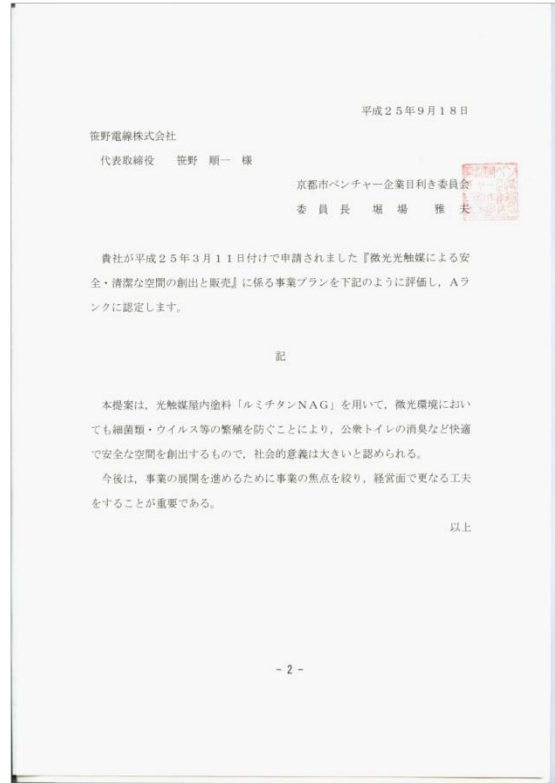
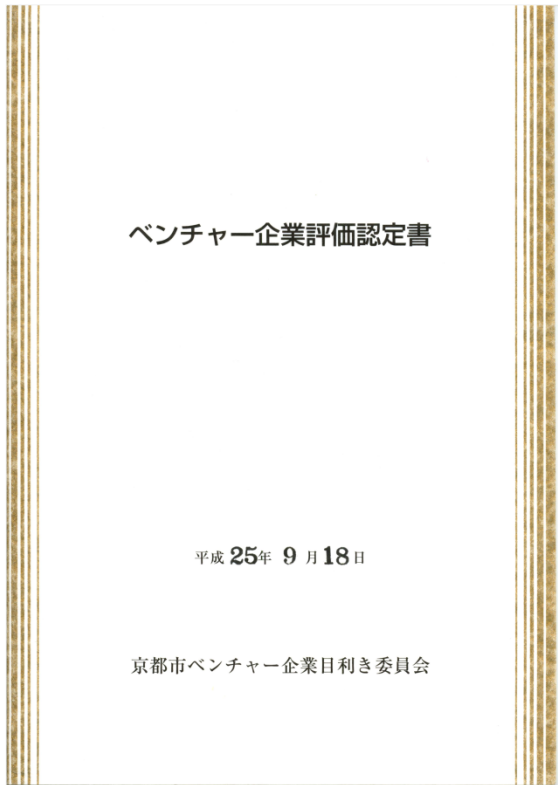
**Sasamic Co., Ltd**

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# Certified as a Rank-A company by Kyoto City Venture Business Evaluation Committee



Sasano Densen was proudly certified as a Rank-A company, the top classification, by Kyoto City Venture Business Evaluation Committee in September 2013, by reason of the enhanced efficacy and the advanced technology we have been making use of in manufacturing our photocatalyst interior paint, “LUMITITAN-NAG”.

**In the global trend where more hygienic and safer living environment is called for, we are and will be making our best endeavors to supply safer and more efficient environment-contributing products, making best use of our advanced technology.**

Junichi Sasano  
Sasano Densen Co., Ltd. President



at Hotel Okura Kyoto where we  
made a final presentation

# Mechanism of LUMITITAN-NAG (Photocatalyst apatite-coated Titanium Dioxide)

## ● Function of LUMITITAN-NAG components

### ① Titanium Dioxide

The photocatalytic effects of Titanium Dioxide inactivate Germs and viruses are inactivated, break down bad smelling substances and harmful VOC (volatile organic compound), and hinder the growth of mold.

### ② Apatite coated

Porous and highly adsorptive apatite (calcium phosphate-based ceramics) crystals are deposited to the surface of Titanium Dioxide. Apatite is efficient in absorbing noxious substances, such as germs, virus, bad smells, VOC, and mold, and is also self-antibacterial itself.

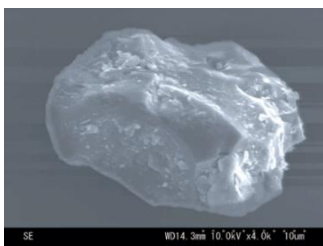
### ③ Silver Nanoparticles

Apatite uniformly carries Silver Nanoparticles. Silver ions are effective in inactivating and eliminating germs and viruses.

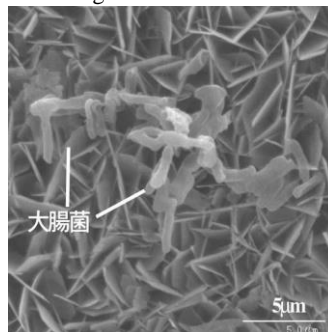


**Deodorant and antibacterial effects last 24 hours a day**  
Apatite-coated Titanium Dioxide employs only 2μW to get effective, and Silver nanoparticles support the effects in darkness during the night.

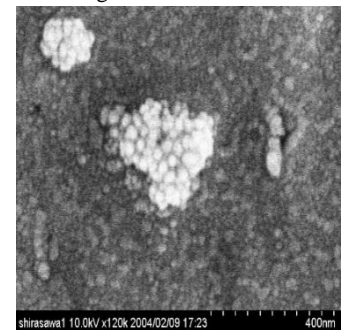
( Titanium Dioxide )



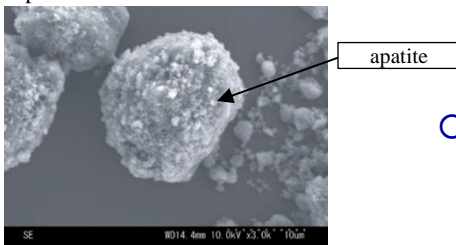
Apatite-coated Titanium Dioxide adsorbing to Colon bacilli



Apatite-coated Titanium Dioxide adsorbing to viruses

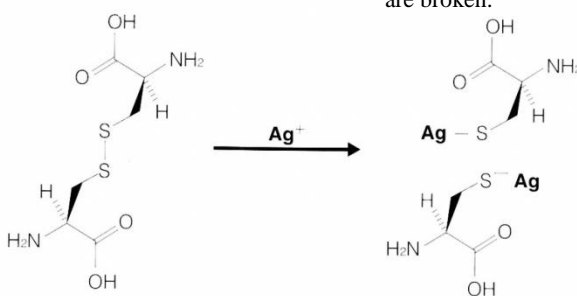


( Apatite-coated Titanium Dioxide )



○ As is indicated in the photos above, bad smelling substances, germs and viruses are adsorbed by apatite, and, in addition, inactivated and killed by the antibacterial effect of Silver Nanoparticles.

### Antibacterial mechanism of Silver nanoparticles



( Cysteine )

(The ss-bond is cut by the silver ions )

Silver ions cut the ss-bond of Cysteine, a component of respiratory enzyme proteins existing between a cell membrane and a cell wall, so that the bacteria stop breathing and get inactivated, or the viruses are inactivated because their envelopes are broken.

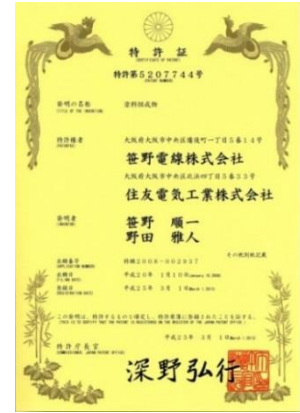
Inactivated, the bacterium is killed.

※Silver Nanoparticles, more easily ionized, have more efficient antibacterial power than Silver Microparticles.

# Apatite-coated Titanium Dioxide carrying Silver Nanoparticles

Combining apatite-coated Titanium Dioxide and Sumitomo Electric Industries' made Silver Nanoparticles, we have succeeded in development of high-performance interior paint. This advanced paint can complement the drawback of apatite-coated Titanium Dioxide which adversely promotes bacterial growth when the light quantity is not sufficient enough.

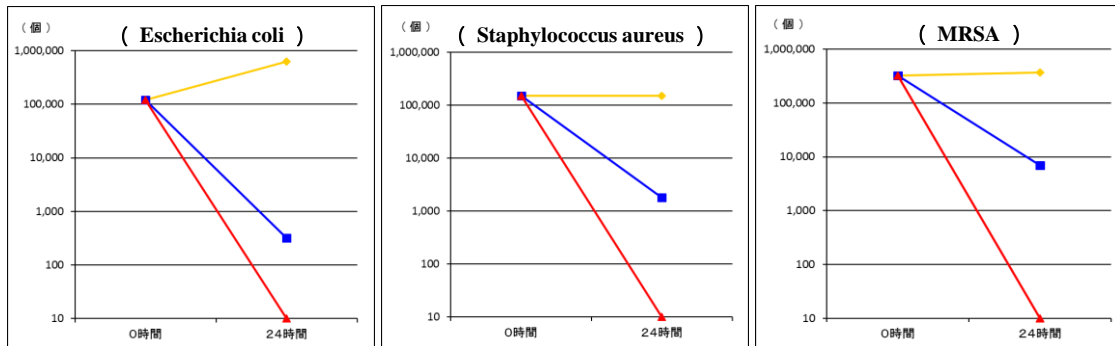
(Coating Compositions Patent : #5207744)



## ● Performance test data of LUMITITAN-NAG

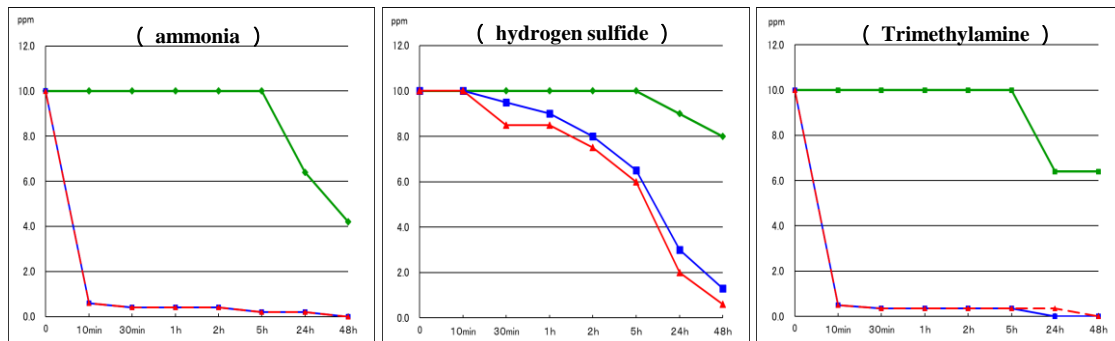
### Antibacterial power test

Kyoto Biseibutsu Kenkyusho (BIKEN)



### Deodorizing performance test

BOKEN QUALITY EVALUATION INSTITUTE



▲ LUMITITAN-NAG with light ( 2μW/cm<sup>2</sup> )      ◆ Blank with light ( 2μW/cm<sup>2</sup> )  
■ LUMITITAN-NAG without light ( 0μW/cm<sup>2</sup> )      ◆ Blank without light ( 0μW/cm<sup>2</sup> )

## 《 Fungi resistance test 》

Hiroshima Environment and Health Association

○ Test Conditions : temperature: 29°C ± 1°C, humidity: 90% and over, dark place: without light or with light(500lx)

Type of fungi		Blank (without light)	LUMITITAN-NAG (without light)	Blank (with light)	LUMITITAN-NAG (with light)
<i>Aspergillus niger</i> NBRC 6341	<i>Aspergillus niger</i>	1	2	2	1
<i>Penicillium funiculosum</i> NBRC 33285	<i>Penicillium</i>	1	1	1	0
<i>Paecilomyces variotii</i> NBRC 33284	Parasitic fungi	1	1	1	0
<i>Gliocladium virens</i> NBRC 6355	Putrefactive bacteria	1	1	1	0
<i>Cheatomium globosum</i> NBRC 6347	<i>Chaetomium</i>	1	1	1	1

Development of hyphae	Evaluation
No hyphae can be observed with naked eyes or under a microscope	0
Hyphae can be observed only under a microscope	1
Hyphae can be observed with naked eyes on not more than 25% of the test piece surface	2
Hyphae can be observed with naked eyes on more than 25% of the test piece surface	3

※ Evaluation criterion : JIS Z 2911 (Fungi resistance test method specified by Japanese Industrial Standards)

# Application examples of LUMITITAN-NAG

## ● kitchen in Chubu Centrair International Airport (for antibacterial and deodorant purposes)



## ● kitchen and cafeteria in Tokai Regional Finance Bureau (for antibacterial and deodorant purposes)



## ● Offices in CHUBU PLANT SERVICE Co., Ltd. inside Yokkaichi thermal power station (for antibacterial and deodorant purposes)



## ● Inside a car (for antibacterial and deodorant purposes)

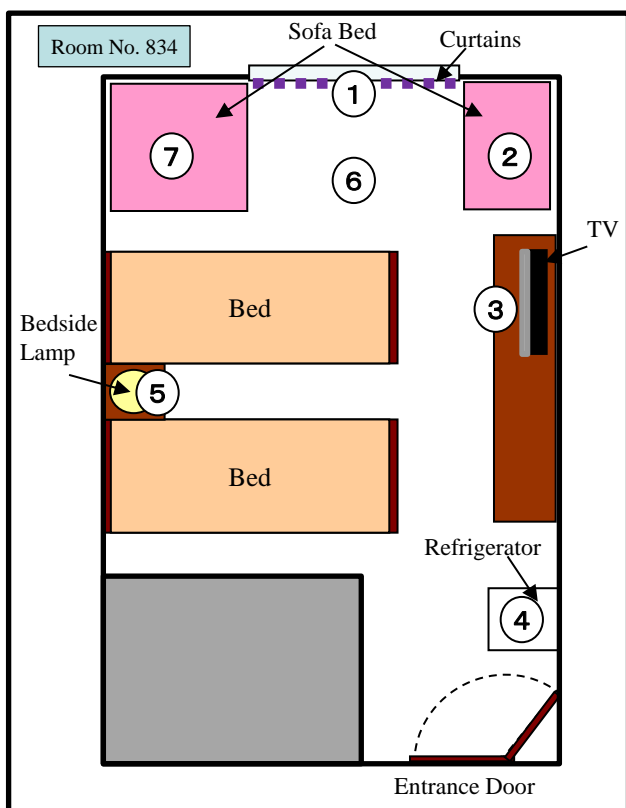


## ● N Hotel Guest Room (Shiga Prefecture) LUMITITAN-NAG coating and Measurement Results of Odor Value

Application Date: April 21 Wed., 2010  
Application Place: N Hotel, Room No.834  
Contractor: Sasamikku Division, Sasano Densen Co., Ltd.

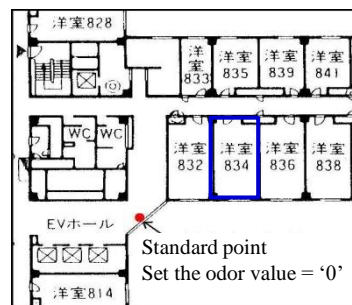
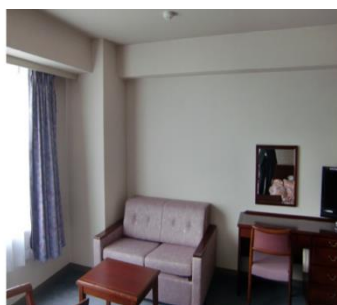
### Odor Measurement Data

< Comparison: Before application and 2 months later >

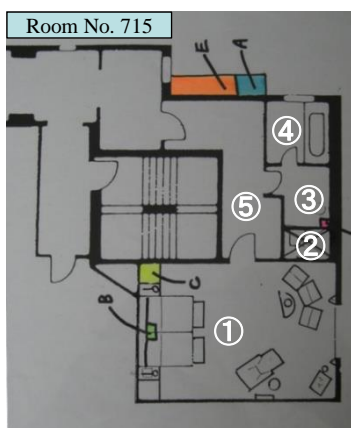


Measurement Spot	Apr. 21 Before Application	Apr. 21 After Application	Jun. 18	Odor Elimination Rate
①	236	55	17	93%
②	253	55	18	93%
③	273	50	18	93%
④	273	64	17	94%
⑤	245	53	17	93%
⑥	262	53	17	94%
⑦	234	53	18	92%
Average	254	54.7	17.4	93%

※ We set the odor value of a standard point as '0' and calculated above data.  
Please use them as a reference value.



## ● K Hotel Guest Room (Wakayama Prefecture) LUMITITAN-NAG coating and Measurement Results of Odor Value



- Application Date: July 22, 2009
  - Cleaned concrete floor of bath room, which was considered to be malodor generating source, then applied a permeable water absorption inhibitor 'CB Water' to prevent water penetration and stains.
  - Applied a photocatalytic paint 'LUMITITAN-NAG' to bedroom wall and ceiling to keep deodorant and antibacterial effects all the time.
- Application Date: November 18, 2009
  - Cleaned carpets of the guest room and corridor, which was considered to be malodor generating source, with 'Eco-friendly agent' and then sterilized with high-temperature steam.

Measurement Date	Jun. 27 Sun.	Jul. 22 Thu.	Average value before application	Dec. 20 Mon.	Dec. 22 Wed.	Dec. 23 Thu.	Dec. 24 Fri.	Average value after application	Odor Elimination Rate
	Weather	Cloudy		Sunny	Rainy	Cloudy	Sunny		
Outside the 1 <sup>st</sup> floor lobby ( Standard )	0	0	0	-2	-4	-4	-4	-3.5	
① Bed room	35 ~ 89	54 ~ 76	66	2	-4 ~ 17	-4	-4 ~ -5	-1	96%
② Around toilet	32 ~ 34	64	48.5	24 ~ 36	-4 ~ -5	-4	-4 ~ 5	5.3	82%
③ Wash room	53 ~ 65	68	63.5	-2	-4 ~ -5	-4	-4	-3.6	98%
④ Bath room	84 ~ 90	68	77.5	-2	-4 ~ 5	-4	-4	-2.6	99%
⑤ Passage (Inside)	26 ~ 65	68 ~ 80	59.8	-2	-4 ~ -5	-4	-4	-3.6	98%
<b>Average Odor Value</b>	57.3	68.8	63.1	4.4	-1.3	-4	-3.2	-1.1	96%

※ Measurement data of Room No. 715 is the relative value to the odor value of the standard point.

# Recent Application of LUMITITAN-NAG

## ● Kyoto City (deodorization and antibacterial application to a public toilet in Shimokashiwano children's park) Ryokusei Division, Construction Bureau, Kyoto City

Application Date: From September 18 to September 23

### Before

A toilet in the park with high use frequency. Kyoto city received improvement requests very often from the neighborhoods because of its terrible malodor.



Malodorous cause of sewage and soil water soaked into concrete floor and tail joints. General cleaning work (by water and detergents) can not remove the malodor.

### Details of Application

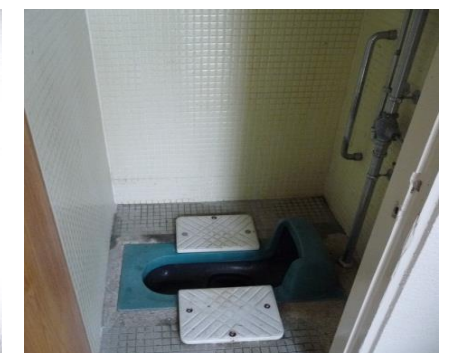
1. Cleaned the whole toilet with a high pressure washer and environment cleaning agent, then coated interior/exterior wall
2. Applied a permeable water absorption inhibitor 'CB Water' to concrete floor and tail joints. (To block malodorous causes such as soiled sewage and prevent penetration of sewage and stain component afterwards.)
3. Applied a photocatalytic interior paint 'LUMITITAN-NAG' to interior wall and ceiling. (deodorization and antibacterial effects)
4. Applied a photocatalytic exterior paint to exterior wall. (stain prevention)



< Applied photocatalytic interior paint 'LUMITITAN-NAG' > < Applied photocatalytic exterior paint >

### After

Chemical Lamp (It does not emit ultraviolet light of less than 300nm which is harmful to eyes and skins.)



In the daytime, sunlight ultraviolet light brings the illumination of  $2\text{-}5\mu\text{W}$  even inside the toilet, exhibiting high deodorant and sterilizing effects. At night, chemical lamps (eyes and skin-friendly) secure the illumination of  $30\mu\text{W}$ , activating high deodorant and sterilizing performance. The neighborhoods no longer suffer from malodor even in the humid summer nights.

※Conventional photocatalytic paints cannot show the same effects as above data since they need light quantity of  $250\mu\text{W}$ .

# ● Quanzhou City, Fujian Province, China (Wanda Plaza 1<sup>st</sup> Floor Restroom) Deodorization and Antibacterial Application

Provided deodorization and antibacterial application to restrooms at Wanda Plaza, one of the three best major department groups in China.

Application Date: February 27, 2013



(Wanda Plaza: Main Entrance)



(Wanda Plaza: Inside the Store)



(Wanda Plaza: 1<sup>st</sup> Floor Restroom)

Air conditioning facilities did not work well.



Straight pipes of the drain were stopped up.



Malodorous stain soaked into tile joints.



- Applied a photocatalytic paint 'LUMITITAN-NAG' to the ceiling
- Gave technical instructions to local contractor



Applied to restroom doors



Applied to restroom wall

- ① Applied a permeable water absorption preventing agent 'CB Water' to prevent malodorous cause of sewage and stain component from soaking into the floor and toilet bowls.
- ② Applied a photocatalytic paint 'LUMITITAN-NAG' to interior wall, ceiling, inside the each cubicle, and doors.
- ③ Additionally installed fluorescent lamps with high ultraviolet light quantity inside the restroom.

※ Drainage and air conditioning facilities were not sufficient enough to stop malodor generating source and the air was retained inside the restroom. The deodorant effect of LUMITITAN-NAG was confirmed even under such a difficult condition for indoor air deodorization.



# ● Nishinomiya City - A nursing home for the elderly (New-building construction of Imazu Shotokuen)

Application Date: From August 31 to September 2

Client: Social Welfare Corporation Shotokuen

Prime Contractor: COHNAN KENSETSU INC.

Photocatalyst Application: Sasamikku Division,

Sasano Densen Co., Ltd.

Application Place: Interior wall of the rooms, 560 m<sup>2</sup>

Coating Material: photocatalytic interior paint 'LUMITITAN-NAG'



【 Rooms of Imazu Shotokuen 】



【 Masking of un-coating part 】



【 Applied 'LUMITITAN-NAG' with spray gun (Horizontal) 】



【 Applied 'LUMITITAN-NAG' with spray gun (Vertical) 】



- Deodorization and antibacterial action will be effective after the application because every room has large windows, which enable LUMITITAN-NAG to provide higher photocatalytic performance.

# Proposal for Restroom Deodorization

## ◎Eco-friendly, Low-price, Long-lasting way of deodorization

Sterilization and deodorization used to be conducted with chemicals such as hypochlorous acid. However, it is now required to improve the environment with low-energy and low-price, not with energy-intensive process, from the viewpoint of environmental conservation. Therefore, we propose the following application using a photocatalyst principle.

### 1. Apply a photocatalytic interior paint 'LUMITITAN-NAG' to interior ceiling and wall

LUMITITAN-NAG is the world's first photocatalytic paint compounding Silver Nanoparticle. By adding apatite which shows same effect as activated carbon to titanium, LUMITITAN-NAG absorbs bacteria, viruses, odor, harmful VOC (Volatile Organic Compounds), and mold, and shows high deodorant performance. It holds more than 99.99% of antibacterial effect.

\* Strength:

- ① It employs only 1/125 as much light quantity as products of other companies ( $2\mu\text{W}/\text{cm}^2$ ) to activate deodorant and antibacterial performance.
- ② It kills bacteria and viruses even in the low light condition because silver ion compensates photocatalyst's weak points.

### 2. Install fluorescent lamps which emit sunlight ultraviolet light

LUMITITAN-NAG has high photocatalyst performance with small light quantity ( $2\mu\text{W}/\text{cm}^2$ ), but the inside of the buildings usually does not have that amount of light quantity. So, it is desirable to install fluorescent lamps to more certainly activate deodorant and antibacterial performance.

### 3. Deodorization and sterilization of ventilation ducts

Mold hyphae and bacteria in ventilation ducts generate malodor. Removing them is also important. However, it is not easy to clean inside the duct compared to cleaning apparatuses of air conditioning facility and ventilating fan. We remove mold hyphae and bacteria in ventilation ducts and decompose odor component by diffusing SUPER LUMITITAN (mist which has a high photocatalytic performance even without irradiation) into the ducts through ventilating opening.

### 4. Cleaning of sanitary wares, drain fittings, and drain pipes

The scale adheres to the surface of sanitary wares (toilet bowls, washbowl, etc.) on which excrement is attached, drain fittings, drain traps, and inside drain pipes. Malodor generating components, such as calcium (urolith), lipid, protein, bacteria, etc. are also attached. Removing or decomposing those urolith and organic compounds prevent the toilet from being filled with malodor.

\* Cleaning methods:

- ① Use urolith removing agent, for example 'Torepika one T (solid type)' or 'Torepika one LS (liquid type)' of SHIKOKU CHEMICALS CORPORATION, to remove calcium.
- ② Use 'EverPrime (made in U.S.A.)' which does not break sealing water, for example, to prevent malodor from flowing backwards.
- ③ Our Sasamic eco-friendly agent 'SUPER LUMITITAN' is compounded with photocatalyst activity improver which maximize photocatalytic effect without irradiation. Washing power is also enhanced by adding two degrading enzymes, lipid and protein. We apply the agent to floors, drain traps, and toilet bowls and remove/decompose malodor generating components such as lipid, protein, bacteria, etc. inside the drain pipes.

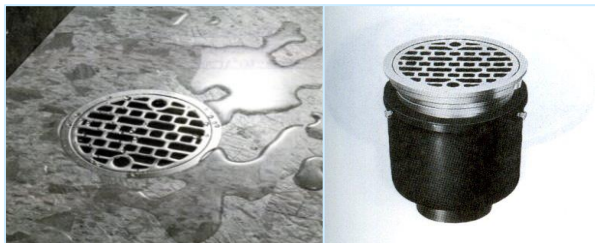
< Applied LUMITITAN-NAG to ceiling and interior wall >



< Diffused SUPER LUMITITAN into inside the duct >



< Drain trap+ (EverPrime / made in U.S.A.) >



< SUPER LUMITITAN Eco-friendly agent >

