



HANSO, INC.

Green Technology Since 2000

Company Profile

Stood up as a company specializing in Advanced Materials

Established in 2000, Hanso Inc., a specialty company on materials, strives to reduce carbon emissions with green management under the slogan of “Green Life Green World.”

Its main products are low-temperature catalysts for reducing air pollution, special chemisorption media for removal of toxic gases from semiconductor, chemical absorbents utilized for gas masks in military, industrial, emergency and more situations. The company has been the pioneer in localizing these products with independent research and development and manufacturing at our own laboratory and factory.

Further, Hanso's Bio-Healthcare department for indoor air quality improving researched and developed UVC Light Air Purifier(Xout Virus), Hydrogen Peroxide Gas Sterilizer(Xout Virus Pro), Portable Biological Particle Collection Device(Xtie Bioparticles), Portable Harmful Gas Removing Device(PA-System) and Multipurpose respiratory protector sterilization system(RPS system). These products are manufactured and sold in South Korea.

Hanso Inc., will continuously contribute to making the world a cleaner place by launching a wide array of green industry products with its Nano Air Molecular Diversity Platform Technology for air pollution reduction.

Catch Carbon Emissions with Hanso Catch Viruses with Hanso



Main Office/Institute



Factory

Company State Table

Company Name	HANSO, INC.
Found	July 07, 2000
President	Sang Woong Kim, Ph.D.
Address	Main Office/Institute: 149, Jukdong-Ro, Yuseong-Gu, Daejeon, Republic of Korea Factory: 18th-71, Munpyeongseo-Ro, Daedeok-Gu, Daejeon, Republic of Korea
Patented Technology	Nano Air Molecular Diversity Technology, Nano Air Molecular Diversity Platform Technology, Oxidation-Sterilization Technology, Catalyst Platform and Engineering Technology
Principal Trade Debtors	Samsung Electronics, Woong Jin Chemicals, Toray Advanced Materials Korea Inc., LG chemicals, SK Innovation, Inc., etc
Business Areas	Advanced Materials, Low-temperature catalyst for reducing air pollution, Chemical Adsorbents for reducing harmful industrial toxic gases, Chemical Adsorbents used for military, disaster and industrial toxic gas mask canisters, Air Sterilization Purifier(Xout Virus) Bio-Decontamination System(Xout Virus Pro) Portable Biological Particle Collection Device(Xtie Bioparticles) Portable Harmful Gas Removing Device(PA-System) Respiratory Protector Sterilization System(RPS System)
Certifications	Venture Company, INNO-Biz Company(AA Class), Specialized Parts and Materials Company, Export Promising Small and Medium Company, Daejeon City Promising Small and Medium Company, High Technology Company, High Credit Rating Company, IBK Innovate Company, Maegyeong Excellent Venture Company, Company of the Best Venture Class of the Federation of Korean Industrials, Samsung Fine Chemicals/Chong Kun Dang/Hanyang ENG Invested Company.

Company History

2016 ~ current

Striving as a company specializing in advanced materials, and changed the Company Name.

- Moved in New Building at 149, Jukdong-Ro, Yuseong-Gu, Daejeon, Republic of Korea
- Constructed new buildings and moved in
- Company name changed as a Hanso, Inc.
- Developed activated carbon-based chemi-sorption materials for military applications in production scale first in Korea
- Selected on the research project used for both military and civilian applications by Defense Acquisition Program Administration

2011 ~ 2015

Growing as a company specializing in Advanced Materials

- Selected on the research project applying military technology for civilian applications by Defense Acquisition Program Administration
- Be awarded Minister of the Environment
- Got an Investment from Hanyang ENG Co., Ltd.
- Got a research contract with Samsung Electronics Co., Ltd.
- Developed medical sterilizers using low-temperature plasma

2006 ~ 2010

First Mass-Production of low-temperature catalyst based on metal oxide in Korea

- First Mass-Production of low-temperature catalyst based on metal oxide for reducing VOCs in Korea
- Provided low-temperature catalyst based on metal oxide for reducing VOCs first to Samsung Electronics Co., Ltd.
- Established the 1st manufacturing factory dedicated to advanced materials for reducing environmentally toxic and hazardous materials
- Successfully commercialized chemical adsorbents for reducing harmful industrial gases

2000 ~ 2005

Founded the company with the investment Samsung Fine Chemicals Co. Ltd.

- Founded Lead Genex, Inc.
- Established the affiliated Advanced Materials Research Institute
- Investment of Samsung Fine Chemicals and Chong Kun Dang Companies
- Nominated as a Company of the Best Venture Class of the Federation of Korean Industrials

PRODUCTS



Low-Temperature Catalyst based on Metal Oxides

Used for reducing Volatile Organic Compounds(VOCs), Ozone, Carbon Monoxide, Odour, Total Hydrogen Carbon, Ethylene Oxide, Nitrogen Oxide(below than 200°C), Sick House Syndrome and more.

Catalyst based on non-Metal Oxides

Used for reducing Volatile Organic Compounds(VOCs), Ozone, Carbon Monoxide, Odour, Total Hydrogen Carbon, Ethylene Oxide, Nitrogen Oxide(below than 350°C), PFCs and more.

Chemical Adsorbents for reducing harmful industrial gases

Used for reducing harmful gases which are generated from the manufacturing process of Semi-Conductor/Display/Solar Cell/LED such as AsH_3 , PH_3 , SiH_4 , H_2S , H_2Se , Cl_2 , F_2 , BCl_3 , HCl , HBr , HF , Amines.

Chemical Adsorbents based on an Impregnated Activated Carbon/ Metal Oxides

Used for reducing HF , HCl , Cl_2 , H_2S , SO_2 ,
Used at Gas Mask Canisters for Military, Civil Defense, Disaster and Industrial applications,
Used at Gas Mask Canisters for Chemical Warfare Agents(CWA)(CK, AC, CG, GB),
Used for reducing Toxic Industrial Chemicals(TICs).

Chemical Adsorbents based on Zeolite

Used for reducing Toxic Industrial Chemicals(TICs) such as C_6H_{12} , NH_3 , SO_2 , Cl_2 , PH_3 , HCHO , EO , CS_2 , NO_2 , Phosphine, Used for the Gas Mask Canisters of Military, Civil Defense, Disaster and Industrials.

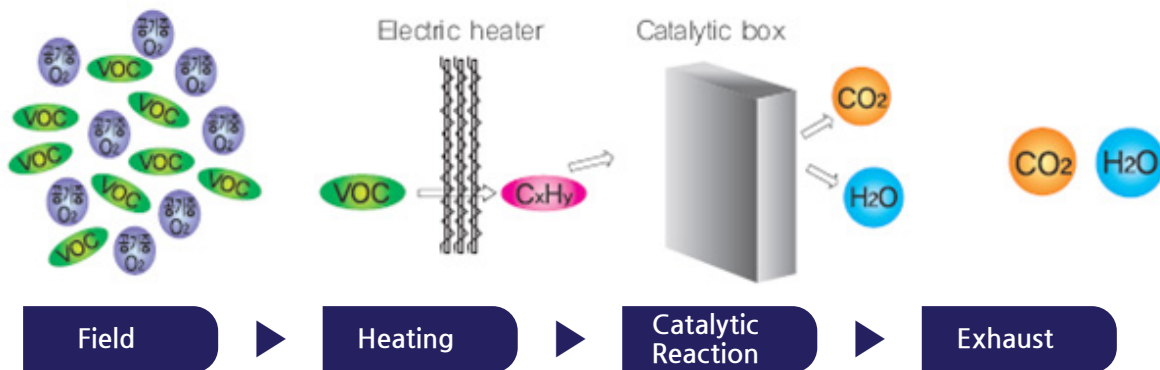
Bio-Indoor Air quality improving Bio-Healthcare Products

Air Sterilization Purifier(Xout Virus), Bio-Decontamination System(Xout Virus Pro), Portable Biological Particle Collection Device(Xtie Bioparticles), Portable Harmful Gas Removing Device(PA-System), Respiratory Protector Sterilization System(RPS System)

Low-Temperature Catalyst Total Turn-Key System

Hanso Inc has first in Korea developed total turn-key systems using low-temperature catalyst based on metal oxide for converting toxic VOCs(volatile organic compounds) and HCs(hydrocarbons) to non-toxic CO₂ and H₂O from various places such as plants, manufacturing facilities, offices, etc.

Principle of Application



Total Turn-Key System Advantage

Low cost-of-ownership in operation

Effective to operate at low-temperature(180-200℃) and good for energy saving thanks to its low-operating temperature compared to the existing technology. Recovery system of catalytic reaction heat depending on concentrations of VOCs/HCs. Guarantee 3 years of warranty with no chemical poisoning on catalysts.

High efficiency of reducing toxic gases

Can be operated at 180-200℃ with removal efficiency of VOCs/HCs >98.5% with <2,000ppm of VOCs/HCs.

Built-in excellent safety system

Can be operated by electric heating instead of burn type using fossil fuel. Hanso catalysts are good for low-temperature and non-flammable. Equipped with a detection system of residual gases. Increased system safety by monitoring controlling system and its parameters in-situ.

Easy to operate

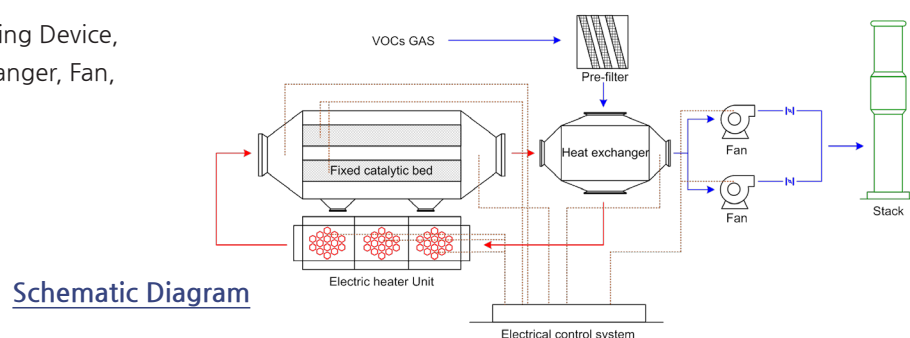
Applicable to various processes and places such as manufacturing factories, plants, offices, etc. Compact design with small foot-print makes field tests and installations easy. Designed to handle a wide range of concentrations of VOCs/HCs during operations.

Environmentally friendly

Can be used with electricity to elevate system temperature. No emission of toxic by-products such as NO_x from catalytic reactions. Can be disposed as no-toxic materials after catalytic use due to non-toxic metal oxides.

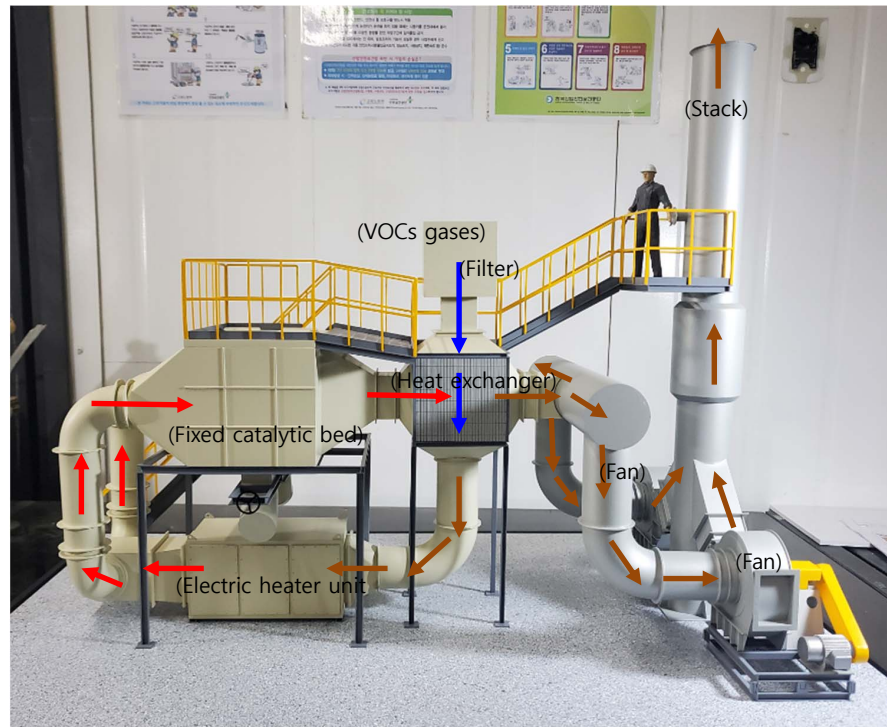
Low-Temperature Catalyst System Configuration

Chamber, Filter, Air Preheating Device, Catalyst Reactor, heat Exchanger, Fan, Emergency Fan, Outlet



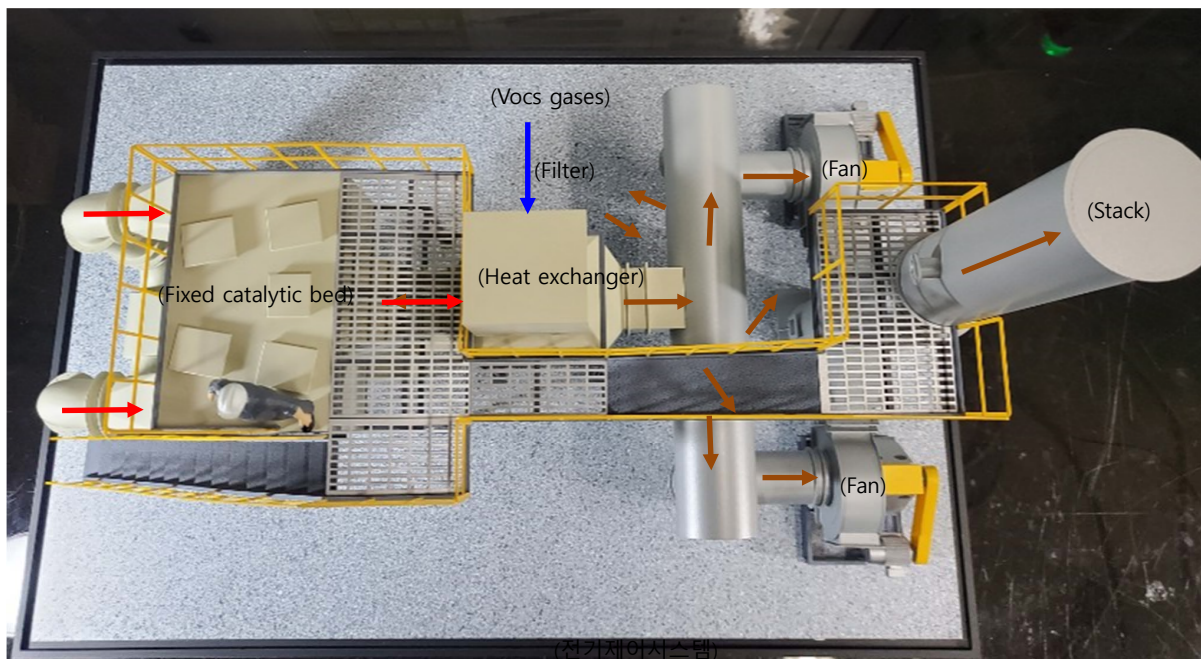
- Temp : 20~30°C
- Temp : 60~80°C
- Temp : 170~250°C

The direction of gas flow



- Temp : 20~30°C
- Temp : 60~80°C
- Temp : 170~250°C

The direction of gas flow



Low-temperature catalyst based on Metal Oxides

X-VOC/X-THC (for reducing VOCs)

Application Field

Chemical Factory, Automobile Painting,
Paint Manufacturing Company,
Wire Manufacturing,
Plastic Film/Bottle Manufacturing,
Sewage and Excreta Treatment Plant,
Polluted Soil Treatment,
Reducing of Vapors after Sterilizing at Commercial Hospital, etc.

Characteristic

- Appearance & Size : Pellet ($\phi=3.3$, more)
- Color : Dark brown
- Bulk density : 0.69~0.72g/cc
- Crush strength : $> 4.0\text{kg}_f/\text{cm}^2$
- Recomm. operating temp. : 180~240°C
- Upper temp. limit : $< 340^\circ\text{C}$



Mechanism

Gas	Mechanism
TVOCs / Total Volatile Organic Compounds	$\text{VOCs} + \text{O}_2 \rightarrow x\text{CO}_2 + y\text{H}_2\text{O}$
THCs / Total Hydro Carbons	$\text{C}_x\text{H}_y + \text{O}_2 \rightarrow x\text{CO}_2 + y\text{H}_2\text{O}$

X-CO (for reducing CO)

Application Field

Breathing Mask for Fire Fighting,
Breathing Gas for Scuba Diving,
Industrial Gas Mask,
Emergency Escape Mask,
Reducing CO from the Refrigerant(He) used for the Ultra-low Temperature Type,
CO Reducing Filter for the Air Cleaning Unit(Home/ Building/Office), etc.

Characteristic

- Appearance & Size : Pellet ($\phi=3.3$, more)
- Color : Dark brown
- Bulk density : 0.69~0.72g/cc
- Crush strength : $> 4.0\text{kg}_f/\text{cm}^2$
- Recomm. operating temp. : 25~160°C
- Upper temp. limit : $< 340^\circ\text{C}$



Mechanism

Gas	Mechanism
CO / Carbon Monoxide	$x\text{CO} + \text{O}_2 \rightarrow x\text{CO}_2$

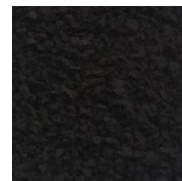
HS-CO (Granule Type)

Application Field

Emergency Escape Mask,
Breathing Mask for Fire
Fighting,
Breathing Gas for Scuba
Diving,
Industrial Gas Mask

Characteristic

- Appearance & Size : Granule type
(12x20mesh, 30x80mesh, more)
- Color : Dark brown
- Bulk density : 0.6~0.65g/cc
- Recomm. operating temp. : 25~160℃
- Upper temp. limit : < 340℃

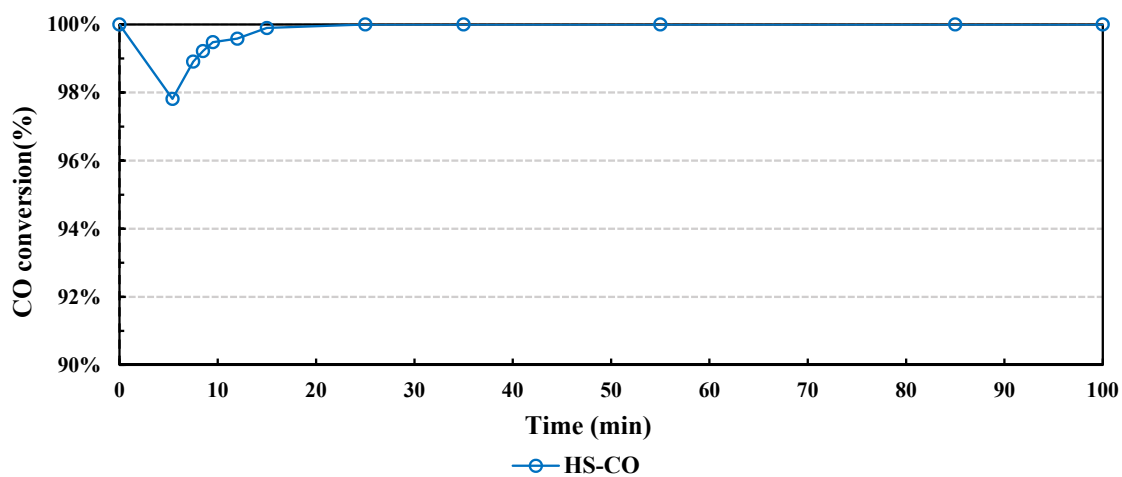


Mechanism

Gas	Mechanism
CO / Carbon Monoxide	$x\text{CO} + \text{O}_2 \rightarrow x\text{CO}_2$

Test Example

Test Gas : CO
Flow rate : 295cc/min
Test Wt. : 0.5g
Inlet Con. : 2,000ppm



X-O₃ (for reducing O₃)

Application Field

Printer, Copier, Sewage
Treatment Plant,
Building Air Cleaning unit, Gas
Treatment after
Semi-Conductor Processing,
Food Processor, etc.

Characteristic

- Appearance & Size : Pellet (ø=3.3, more)
- Color : Dark brown
- Bulk density : 0.69~0.72g/cc
- Crush strength : > 4.0kg_f/cm²
- Recomm. operating temp. : 25~160℃
- Upper temp. limit : < 340℃



Mechanism

Gas	Mechanism
O ₃ / Ozone	$2O_3 + O_2 \rightarrow 4O_2$

X-NO_x (for reducing NO_x)

Application Field

Electric Power Plant Boiler,
Industrial Boiler,
Gas Turbine, Waste Incinerator,
Off-gas Treatment,
Chemical Plant, Diesel/Gas
Engine, Shipping Engine, etc.

Characteristic

- Appearance & Size : Pellet (ø=3.3, more)
- Color : Dark brown
- Bulk density : 0.69~0.72g/cc
- Crush strength : > 4.0kg_f/cm²
- Recomm. operating temp. : 180~220℃
- Upper temp. limit : < 340℃



Mechanism

Gas	Mechanism
NO _x	$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$

Catalyst based on non-Metal Oxides

HS-VOC (for reducing VOCs)

Application Field

Chemical Factory, Automobile Painting,
Paint Manufacturing Company,
Wire Manufacturing, Plastic Film/Bottle Manufacturing,
Sewage and Excreta Treatment Plant,
Polluted Soil Treatment,
Reducing of Vapors after Sterilizing at Commercial Hospital,
Food Manufacturing Factory, Print House, Fiber Dyeing, etc.

Characteristic

- Appearance : Honeycomb
- Standard Size : 150x150x50~150mm
- Color : Dark gray
- Cell density : 200cpsi~400cpsi



Mechanism

Gas	Mechanism
TVOCs / Total Volatile Organic Compounds	$\text{VOCs} + \text{O}_2 \rightarrow \text{xCO}_2 + \text{yH}_2\text{O}$
THCs / Total Hydro Carbons	$\text{CxHy} + \text{O}_2 \rightarrow \text{xCO}_2 + \text{yH}_2\text{O}$

HS-CO (for reducing CO)

Application Field

Breathing Mask for Fire Fighting, Breathing Gas for Scuba Diving,
Industrial Gas Mask, Emergency Escape Mask,
Reducing CO from the Refrigerant(He) used for the Ultra-low Temperature Type, CO Reducing Filter for the Air Cleaning Unit(Home/ Building/Office), etc.

Characteristic

- Appearance : Honeycomb
- Standard Size : 150x150x50~150mm
- Color : Dark gray
- Cell density : 100cpsi~400cpsi



Mechanism

Gas	Mechanism
CO / Carbon Monoxide	$\text{xCO} + \text{O}_2 \rightarrow \text{xCO}_2$

HS-O₃ (for reducing O₃)

Application Field

Printer, Copier, Sewage Treatment Plant,
Building Air Cleaning unit, Gas Treatment after Semi-Conductor Processing,
Food Processor, etc.

Characteristic

- Appearance : Honeycomb
- Standard Size : 150x150x50~150mm
- Color : Black
- Cell density : 200cpsi~400cpsi



Mechanism

Gas	Mechanism
O ₃ / Ozone	$2\text{O}_3 + \text{O}_2 \rightarrow 4\text{O}_2$

HS-NO_x (for reducing NO_x)

Application Field

Electric Power Plant Boiler,
Industrial Boiler,
Gas Turbine, Waste Incinerator,
Off-gas Treatment,
Chemical Plant, Diesel/Gas
Engine, Shipping Engine, etc.

Characteristic

- Appearance & Size : Pellet (ø=3.0, more)
- Color : light beige
- Bulk density : 0.73~0.75g/cc
- Crush strength : > 1.0kg_f/cm²
- Recomm. operating temp. : 260~400℃
- Upper temp. limit : < 400℃



Mechanism

Gas	Mechanism
NO _x	$4\text{NO} + 4\text{NH}_3 + \text{O}_2 \rightarrow 4\text{N}_2 + 6\text{H}_2\text{O}$

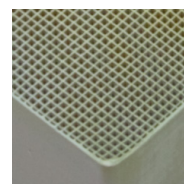
HS-NO_x (for reducing NO_x)

Application Field

Electric Power Plant Boiler,
Industrial Boiler,
Gas Turbine, Waste Incinerator,
Off-gas Treatment,
Chemical Plant, Diesel/Gas
Engine, Shipping Engine, etc

Characteristic

- Appearance : Honeycomb
- Standard Size : 150x150x50~150mm
- Color : Bluish green
- Cell density : 100cps~400cps
- Recomm. operating temp. : 260~400℃



Mechanism

Gas	Mechanism
NO _x	$4\text{NO} + 4\text{NH}_3 + \text{O}_2 \rightarrow 4\text{N}_2 + 6\text{H}_2\text{O}$

HS-H₂S (for reducing H₂S)

Application Field

Landfill gas, Digester gas, Air
purification,
Sewer gas(methane gas/CO₂
gas), Waste water treatment
plants, etc.,

Characteristic

- Appearance & Size : Granules (4x12 mesh)
- Color : light gray
- Bulk density : 0.36~0.4g/cc
- Capacity : 1.0 Kg H₂S/Kg media



Mechanism

Gas	Mechanism
H ₂ S	$\text{M-O} + \text{H}_2\text{S} \rightarrow \text{M-S} + \text{H}_2\text{O}$ $\text{M-S} + \text{O}_2 \rightarrow \text{M-SO}_2$ $\text{M-SO}_2 + \text{H}_2\text{S} \rightarrow \text{M-O} + 2\text{S} + \text{H}_2\text{O}$ Overall: $\text{H}_2\text{S} + \frac{1}{2} \text{O}_2 \rightarrow \text{S} + \text{H}_2\text{O}$

HS-PFC (for reducing PFCs)

Application Field

Semi-Conductor or LCD/TFT
Processing,
Amorphous Silicon Thin Film
Solar Battery Process, etc.

Characteristic

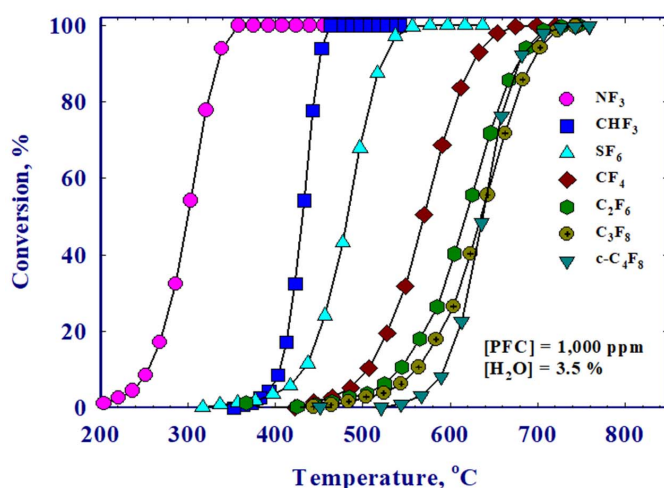
- Appearance & Size : Granules (4x8 mesh)
- Color : Dark navy
- Bulk density : $\sim 0.4 \text{ g/cc}$
- Crush strength : $> 4.0 \text{ kg}_f/\text{cm}^2$
- Recomm. operating temp. : $400 \sim 800^\circ\text{C}$
- Upper temp. limit : $< 1,000^\circ\text{C}$



Mechanism

Gas	Mechanism
NF_3 , CHF_3 , SF_6 , CF_4 , C_2F_6 , C_3F_8 , $\text{c-C}_4\text{F}_8$	$\text{XF}_n + \text{M} \rightarrow \text{MF} + \text{XO}(\text{XO}_2)$ $\text{XF}_n + \text{H}_2\text{O} \rightarrow \text{HF} + \text{XO}(\text{XO}_2)$

PFC Destruction - Effects of PFC



Catalyst destroys a wide range of PFCs

NF_3 and SF_6 most readily decomposed

Temperature $\sim 700^\circ\text{C}$ required to destroy perfluorocarbons

CF_4 most readily destroyed perfluorocarbon (opposite for thermal)

Chemical Adsorbents for reducing harmful industrial gases

X-BCl₃

Application Field

Ion Implant Process, Ashing Process, Epi Process, Chemical Vapor Deposition(CVD) Process, For reducing of Acid Vapors such as HCl, HF, HBr, BCl₃, etc.

Characteristic

- Appearance & Size : Pellet (ø=4.0, more)
- Color : Brown
- Bulk density : 0.6~0.7g/cc
- Crush strength : > 4kg_f/cm²
- Upper temp. limit : < 100℃



Mechanism

Gas	Mechanism	TLV (ppm)
BCl ₃	$\text{BCl}_3 + 3\text{MOH} \rightarrow 3\text{MCl} + \text{B}(\text{OH})_3$	5
	$\text{BCl}_3 + 3\text{MO}(\text{OH}) \rightarrow 3\text{MOCl} + \text{B}(\text{OH})_3$	
HBr	$2\text{HBr} + \text{M}(\text{OH})_2 \rightarrow \text{MBr}_2 + 2\text{H}_2\text{O}$	3
HCl	$3\text{HCl} + \text{MO}(\text{OH}) \rightarrow \text{MCl}_3 + 2\text{H}_2\text{O}$	5
HF	$6\text{HF} + \text{M}_2\text{O}_3 \rightarrow 2\text{MF}_3 + 3\text{H}_2\text{O}$	3
SiH ₄	$\text{SiH}_4 + 2\text{MOH} \rightarrow \text{M}_2\text{Si} + 2\text{H}_2\text{O} + \text{H}_2$	5

X-Cl₂

Application Field

Ion Implant Process, Ashing Process, Epi Process, Chemical Vapor Deposition(CVD) Process, For reducing of Acid Vapors such as Cl₂, F₂, etc.

Characteristic

- Appearance & Size : Pellet (ø=2.2, more)
- Color : White
- Bulk density : 0.6~0.7g/cc
- Crush strength : > 2.0kg_f/cm²
- Upper temp. limit : < 100℃



Mechanism

Gas	Mechanism	TLV (ppm)
Cl ₂	$\text{Cl}_2 + 2\text{MOH} \rightarrow 2\text{MCl} + \text{H}_2\text{O} + 1/2\text{O}_2$	1
	$\text{Cl}_2 + \text{M}(\text{OH})_2 \rightarrow \text{MCl}_2 + \text{H}_2\text{O} + 1/2\text{O}_2$	

X-Amines

Application Field

Diffusion Process, Chemical Vapor Deposition(CVD) Process, For reducing of Alkaline Gases such as NH_3 , TMA, Amino-Silane, etc.

Characteristic

Appearance & Size : Pellet ($\phi=4.0$, more)
 Color : Light brown
 Bulk density : 0.8g/cc
 Crush strength : $> 4.0\text{kg}_f/\text{cm}^2$
 Upper temp. limit : $< 100^\circ\text{C}$



Mechanism

Gas	Mechanism	TLV (ppm)
NH_3	$4\text{NH}_3 + \text{MSO}_4 \rightarrow \text{M}(\text{NH}_3)_4\text{SO}_4$	25

X- H_2S

Application Field

Diffusion Process, Chemical Vapor Deposition(CVD) Process, For reducing of Acid Gases, H_2S , H_2Se , PH_3 , AsH_3 , B_2H_6 , etc.

Characteristic

- Appearance & Size : Pellet ($\phi=3.0$, more)
 - Color : Light blue
 - Bulk density : 0.8g/cc
 - Crush strength : $> 2.0\text{kg}_f/\text{cm}^2$
 - Upper temp. limit : $< 50^\circ\text{C}$



Mechanism

Gas	Mechanism	TLV (ppm)
H_2S	$\text{Cu}(\text{OH})_2 + \text{H}_2\text{S} \rightarrow \text{CuHS} + 2\text{H}_2\text{O}$	5
	$2\text{Cu}(\text{OH})_2 + \text{H}_2\text{S} \rightarrow \text{Cu}_2\text{S} + 4\text{H}_2\text{O}$	

X- SiH_4

Application Field

Ion Implant Process, Ashing and Etching Process, Epi Process, Some Chemical Vapor Deposition(CVD) Process, For reducing of SiH_4 gas, etc.

Characteristic

- Appearance & Size : Pellet ($\phi=3.0$, more)
 - Color : Purple
 - Bulk density : 0.70~0.75g/cc
 - Crush strength : $> 2.0\text{kg}_f/\text{cm}^2$
 - Upper temp. limit : $< 100^\circ\text{C}$



Mechanism

Gas	Mechanism	TLV (ppm)
SiH_4	$\text{SiH}_4 + 2\text{MOH} \rightarrow \text{M}_2\text{Si} + 2\text{H}_2\text{O} + \text{H}_2$	5

Chemical Adsorbents

HS-V2(based on metal oxide / impregnated activated carbon)

Application Field

For reducing Acid Gases such as HF, HCl, Cl₂, H₂S, SO₂, etc.

Characteristic

- Appearance & Size : Pellet (ø=3.0, more)
- Color : Black
- Bulk density : 0.60~0.65g/cc
- Crush strength : > 4.0kg_f/cm²
- Upper temp. limit : < 100℃



Mechanism

Gas	Mechanism	TLV (ppm)
HCl	$3\text{HCl} + \text{MO}(\text{OH}) \rightarrow \text{MCl}_3 + 2\text{H}_2\text{O}$	5
Cl ₂	$\text{Cl}_2 + 2\text{MOH} \rightarrow 2\text{MCl} + \text{H}_2\text{O} + 1/2\text{O}_2$	1
H ₂ S	$\text{Me}(\text{OH})_2 + \text{H}_2\text{S} \rightarrow \text{MeHS} + 2\text{H}_2\text{O}$	5
	$2\text{Me}(\text{OH})_2 + \text{H}_2\text{S} \rightarrow \text{Me}_2\text{S} + 4\text{H}_2\text{O}$	

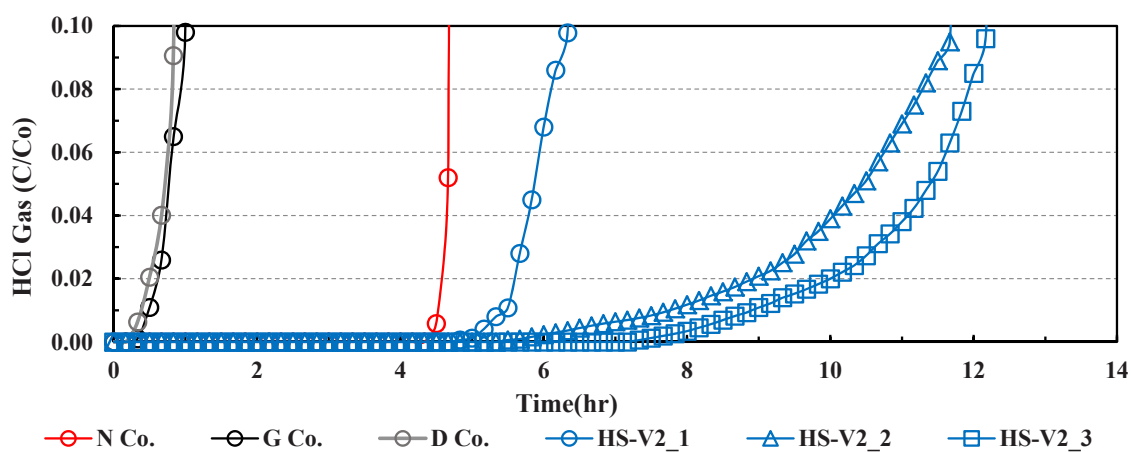
Test Example

Test Gas : HCl 1,000ppm in N₂

Flow Rate : 100cc/min

Cat. Wt. : 0.5g

HANSO Products : HS-V2_1, HS-V2_2, HS-V2_3



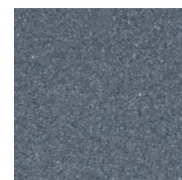
HS-MCAZ(based on impregnated activated carbon)

Application Field

For Gas Mask Canisters of Military, Civil Defense and Industrials, For Reducing Toxic Industrial Chemicals(TICs) such as C_6H_{12} , NH_3 , SO_2 , HCl , H_2S , CS_2 , PH_3 , $HCHO$, NO_2 , For Reducing Toxic Chemical Agents such as $CK(CNCl)$, $AC(HCN)$, $CG(Phosgene)$, $GB(Sarin)$, $DMMP$, etc.

Characteristic

- Reference : MIL-DTL-32101
- Appearance & Size : Granule type
- Color : Black
- Bulk density : 0.45~0.48g/cc
- Total pore volume : 0.7cm³/g
- Upper temp. limit : < 150°C

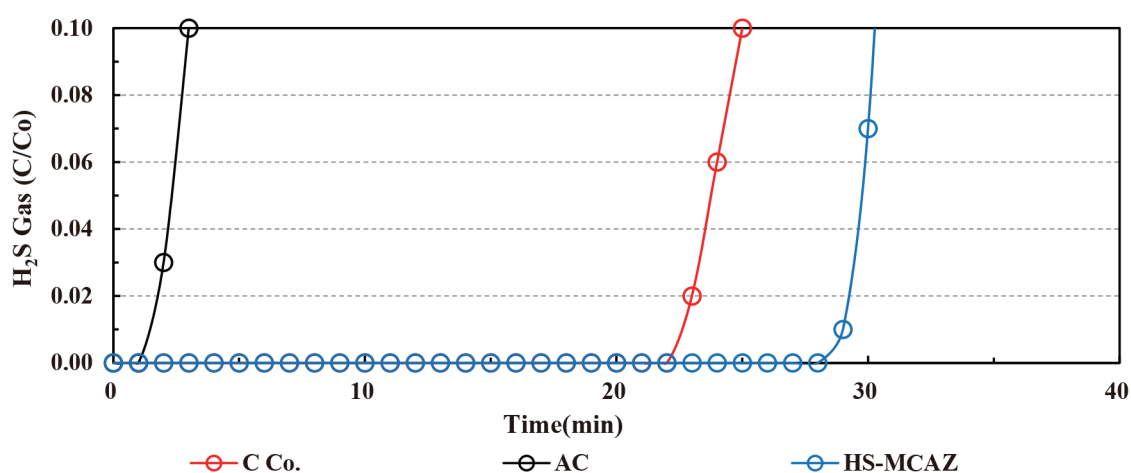


Mechanism

Gas	Mechanism	Minute
CNCl	$CNCl + H_2O \rightarrow HOCN + HCl$ $CNCl + H_2O \rightarrow HOCl + HCN$	>55
HCN	$2HCN + ZnO \rightarrow Zn(CN)_2(s) + H_2O$ $4HCN(g) + 2CuO \rightarrow 2Cu(CN)(s) + (CN)_2(g) + 2H_2O$ $(CN)_2(g) + 2H_2O \rightarrow (CONH_2)(g)$	>28

Test Example

Test Gas : H_2S 5,000ppm in N_2
 Flow Rate : 100cc/min
 Cat. Wt. : 0.5g
 HANSO Products : HS-MCAZ



HS-FG(based on impregnated activated carbon)

Application Field

Emergency Escape Mask,
Breathing mask for Fire Fighting,
Industrial Gas mask, HCl, HCN,
H₂S, SO₂, NO₂, C₆H₁₂, etc.

Characteristic

- Appearance & Size : Granule type
- Color : Black
- Bulk density : 0.5~0.6g/cc
- Total pore volume : 0.7cc/g
- Upper temp. limit : < 150°C

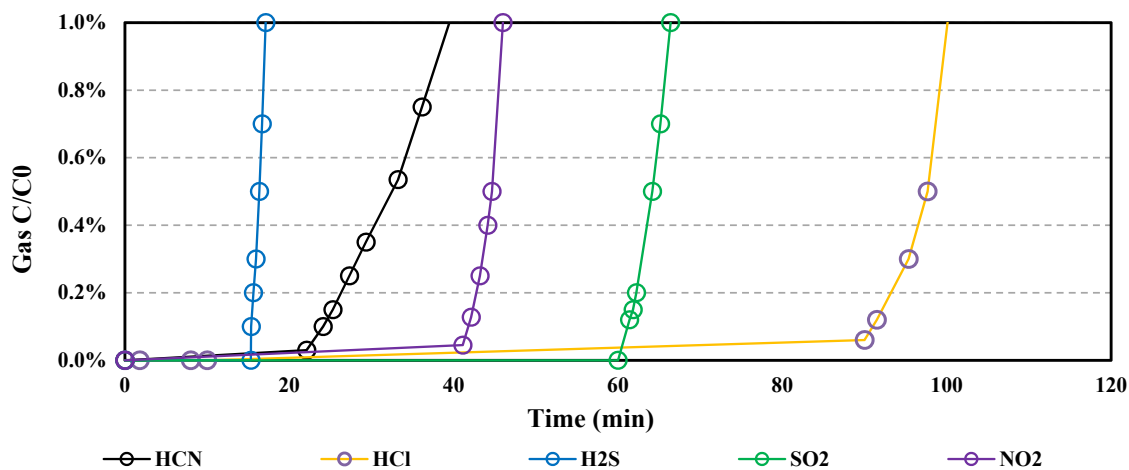


Mechanism

Gas	Mechanism
HCN	$C-CuO + HCN \rightarrow C-Cu(CN)_2, C-CN_2 + H_2O$
HCl	$C-CuO + HCl \rightarrow C-CuCl_2 + H_2O$
H ₂ S	$C-Cu(OH)_2 + H_2S \rightarrow C-CuS + 2H_2O$ $C=O + H_2S \rightarrow C-S + H_2O$
SO ₂	$C-KOH + SO_2 \rightarrow C-K_2SO_4 + H_2O, C-SO^*$
NO ₂	$AC + NO_2 \rightarrow CN^*, CNO^*, CNO_3^*$

Test Example

Test Gas : NO₂, HCl, H₂S, HCN, SO₂
Flow Rate : 295cc/min
Test Wt. : 0.5g
Inlet Con.: SO₂ 2,000ppm
NO₂, HCl, H₂S, HCN 1,000ppm



HS-4TICs (based on impregnated activated carbon)

Application Field

For reducing Industrial Toxic
Chemicals(TICs)
(C_6H_{12} , H_2S , SO_2 , Cl_2 , etc.)

Characteristic

- Appearance & Size : Granule type
- Color : Black
- Bulk density : 0.5~0.6g/cc
- Total pore volume : 0.7cc/g
- Upper temp. limit : $< 150^\circ C$

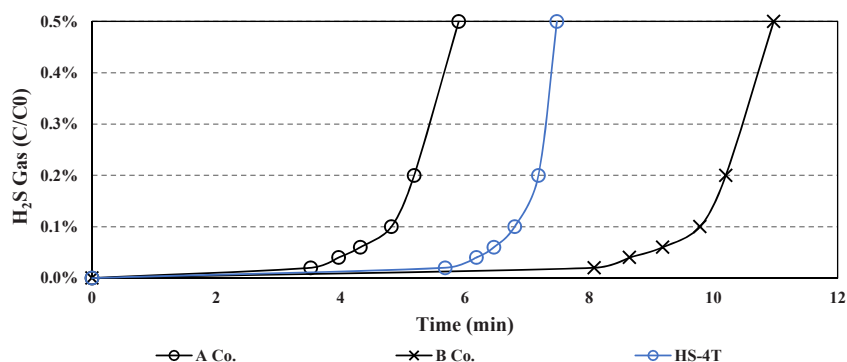
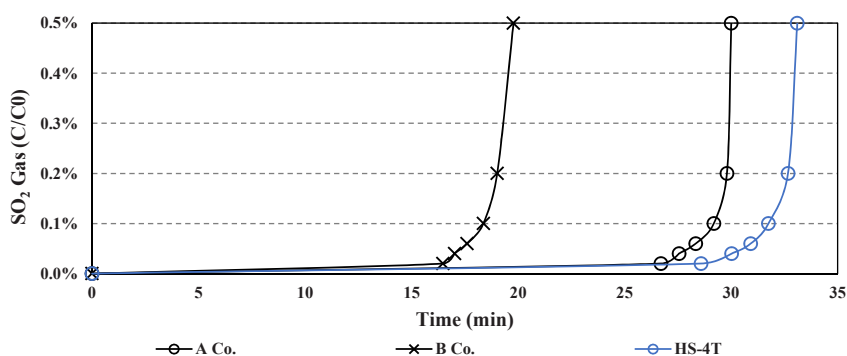
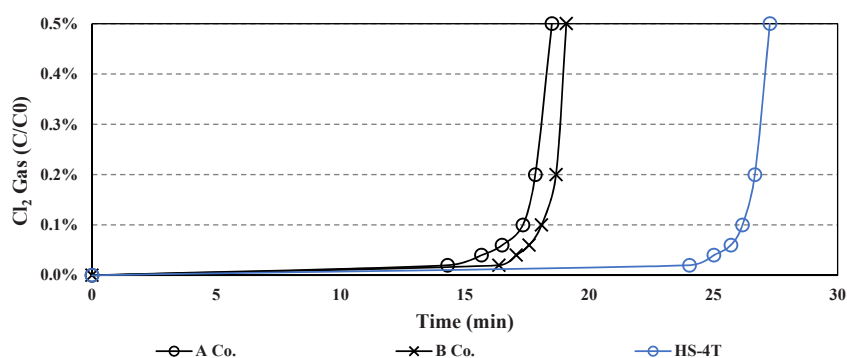


Mechanism

Gas	Mechanism
Cl_2	$C-CuO + Cl_2 \rightarrow C-CuCl_2 + H_2O$
H_2S	$C-Cu(OH)_2 + H_2S \rightarrow C-CuS + 2H_2O$ $C=O + H_2S \rightarrow C-S + H_2O$
SO_2	$C-KOH + SO_2 \rightarrow C-K_2SO_4 + H_2O$, $C-SO^*$

Test Example

Test Gas : Cl_2 , H_2S , SO_2
Flow Rate : 100cc/min
Test Wt. : 0.5g
Inlet Con.: 5,000ppm



HS-ZM(based on Zeolite)

Application Field

For Reducing Toxic Industrial Chemicals(TICs) such as C_6H_{12} , NH_3 , SO_2 , HCl , H_2S , CS_2 , PH_3 , $HCHO$, NO_2 , EO , Metal-ion exchange Zeolite, etc.

Characteristic

- Appearance : Pellet/Granule type
- Color : White/Ivory
- Bulk density : 0.40~0.6g/cc
- Hardness strength : > 90%
- Upper temp. limit : < 600℃

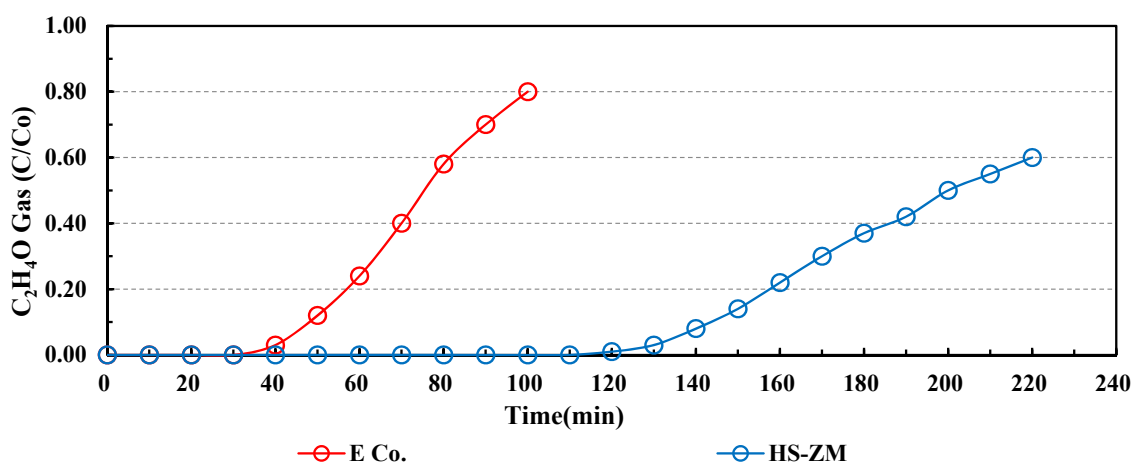


Zeolite type

K-A, Na-A, Ca-A.
10X, 13X, Y.
ZSM-5.

Test Example

Test Gas : Ethylene oxide 988ppm in N_2
Flow Rate : 700cc/min
Space Velocity : $14,928hr^{-1}$
HANSO Products : HS-ZM



Low-Temperature Catalyst Application Examples

Company	GHSV(CMM)	Removal Materials	Energy Source	Year
S Company	350	Toluene, Isopropyl alcohol	Electricity	2008
S Company	450	Toluene, Isopropyl alcohol	Electricity	2008
G Company	15	Ketone	Electricity	2008
S Company	300	Toluene, Isopropyl alcohol	Electricity	2009
S Company	100	Isopropyl alcohol	Electricity	2009
S Company	150	Isopropyl alcohol	Electricity	2010
S Company	250	Isopropyl alcohol	Electricity	2011
D Company	500	Acetaldehyde	Steam	2012
D Company	200	Acetaldehyde	Steam	2012
D Company	200	Dimethyl formamide	Steam	2012
D Company	20	Dimethyl formamide	Electricity	2012
H Company	50	Dimethyl formamide	Electricity	2012
D Company	40	Dimethyl formamide	Electricity	2012
C Company	35	Dimethyl formamide	Electricity	2012

Low-Temperature Catalyst Application Examples



450CMM



300CMM



200CMM



500CMM



350CMM



300CMM

Air Sterilization Purifier(Xout Virus)

HS-ASP300

Application Field

- Eliminates viruses such as Avian Influenza, H1N1, MERS, foot-and-mouth disease, and SARS-CoV-2.
- Purifies and deodorizes air

Characteristic

- Applied Korea's defense technology
- UV-C Kill-Zone Technology for various applications

XOUT VIRUS SPECIFICATION SHEET

Item	Description	
Applicable Space	120m ² , 40 Acreage	
Blower Airflow	Max 300m ³ /h, Adjustable	
UV-C Lamp	45μW/cm ² @254nm, 4set	
Dimensions	Overall	W 450mm x D 470mm x H 700mm
	Weight	35 Kg
Operation	Continuous Operation, Timer: 2hr, 4hr, 8hr	
Main Parts	Pre Filter HEPA Filter UV-C Lamp Kill Zone Activated Carbon Honeycomb Block Filter	
Electrical	220~230 V, 50/60 Hz, Single Phase, 180 W	
Korea Certification Mark	 ZF07009-20001A R-R-hsl-HA-ASP200	



Bio-Decontamination System(Xout Virus Pro)

HS-VHP

Application Field

Epidemics such as MERS (Middle East Respiratory Syndrome) and Severe acute respiratory syndrome (SARS) have been huge threats to human health. Every time it happened, there have been lack of proper equipment and treatments. Hanso's Preventive Sterilizer, HS-VHP, expects to critically improve to preventing and sterilizing sources such as virus and bacteria to these epidemics thanks to Hanso's patented technology, homogenous spraying of extremely fine mist of sterilizing agent(Steilant).

Any places with potential contamination and threat to human health by virus and bacteria such as public places, senior care centers, nursing homes, schools, hospitals, day care centers, kind cares, food production facility, pharmaceutical production lines.

Characteristic

- Short time sterilization
- Environmentally friendly Sterilizing agent(Steilant)
- Hanso's patented spraying technology creating extremely fine mist
- Extremely effective spraying technology using turbulent flow at high pressure
- Non-harmful sterilizing agent(Steilant, H_2O_2) to equipment and devices being sterilized
- Wide of range of sterilization such as MERS, SARS, Ebola, super-bacteria and micro organism

XOUT VIRUS PRO SPECIFICATION SHEET

Item	Description	
Max Treatable Volume*	Up to 100m ³	
Blower Airflow	Max 120m ³ /h, Adjustable	
Peristaltic Pump	1~10 g/min, Adjustable	
Dimensions	Overall	W 270mm x H 280mm x L 480mm
	Weight	15 Kg
Sterilization Agent	Hydrogen Peroxide Solution (30~50 %)	
Electrical	220~230 V, 50/60 Hz, Single Phase, 1 kVA (Max.)	
Materials	Stainless Steel AISI 304	



Portable Biological Particle Concentrator(Xtie Bioparticles)

HS-BVCC20

Application Field

- Medical facilities such as hospitals, custom inspection areas at terminals, airports and ports, etc. treating and inspecting bird influenza, mutated influenza, MERS, Foot-to-mouth disease, etc.
- Military facility, public places with airports, transportation terminals, harbor, bus stations, etc.
- Measurement of air quality and environmental concerns to human health with virus and bacteria

Characteristic

- Electric bacteria concentrator by making bacteria electrically charged
- Extremely effective non-destructive collection of bacteria less than 1 microns(μm)

XTIE BIOPARTICLES SPECIFICATION SHEET

Item	Description	
Sampling Flow Rate	2.0 Liters per min, adjustable	
Particle Size Collection	0.05-10 micron	
Liquid Sample Volume	0.2~0.5 mL	
Sampling Times	10, 30, 60, 120 and 300 min	
Dimensions	Overall	W 280mm x L 300mm x H 400mm
	Weight	9.5 Kg (Including Battery : 5kg)
Battery	24VDC, 13Ah, Lithium-ion Phosphate Battery, 5kg	
Electrical	220VAC, 60 Hz, Single phase, 30W	



Portable Harmful Gas Removing Device(PA-System)

HS-PA

Application Field

- Industrial sites where semiconductors, semiconductor materials, displays (LCD, LED chip, OLED), solar panels, fuel cells and secondary cell battery, fine material parts, fine chemicals, etc. are manufactured.
- Manufacturing sites with devices that produce acidic or basic gases

Characteristic

The device adsorbs the harmful gases produced in the industrial sites that manufacture semiconductors and fine chemicals. During the maintenance and repair process of the facilities and devices that emit harmful gases, the device allows field workers to work safely as the device can adsorb and remove the remaining harmful gases. This air pollution prevention device can be connected to the facility or device in which toxic gases are produced, to immediately remove and dispose of the remaining toxic gases. The device contains Hanzo Inc.'s self-developed adsorbents, and chemically adsorbs and safely removes the acidic and basic toxic gases produced at industrial sites.

PA-SYSTEM SPECIFICATION SHEET

Item	Description	
Blower Gas flow	Max 5 m ³ /Hr., Adjustable	
Dimensions	Overall	W 450mm x D 470mm x H 500mm
	Weight	40 Kg
Canister	Remove Gas	HCl, Cl ₂ , HF, BCl ₃ , VOCs
	Volume	1.0 liter(2set)
Electrical	Single Phase:100~230 V, 50/60 Hz, 60 W Battery: 24VDC, 13,600mAh	



Multipurpose Respiratory Protector Sterilization System(RPS System)

HS-RPS

Application Field

Sterilizes and disinfects gas masks, helmets, combat vests, water bottles, and other equipment used by personnel in military units, police, and fire departments involved in military, counter-terrorism actions, and/or firefighting to protect their respiratory and physical systems from bacteria and viruses

Characteristic

- Fast sterilization power and excellent penetration power
- Zero residual substances, environmentally friendly
- 99.99% guaranteed sterilization efficacy

HS-RPS SYSTEM SPECIFICATION SHEET

Item	Description				
Function	Hydrogen peroxide vaporization, dry, device control using digital touch screen				
Electrical	220VAC	Size	130cm x 66cm x 195cm (W x D x H)		
Operation time	60 minutes (10 minutes to dry, sterilization 20 minutes, 30 minutes to reduce hydrogen peroxide concentration). Except battle vests need 120 minutes.				
Sterilization item	Classification	Gas masks	Bulletproof helmets	Battle vests	Water bottles
	Quantity	20EA	20EA	10EA	20-50EA



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