Company Profile

Growing as a company specializing in Advanced Materials

Hanso Inc., as a specialty company on materials, has developed low-temperature catalysts first in Korea based on its patented technology of combinatorial chemistry and nano-scale control in material synthesis. In addition, we have also developed special chemisorption media for removal of toxic gases from semiconductor, flat panel display (FPD) and light emitting diode (LED). Special activated carbons developed by us have been proven on high performance and quality at gas masks for applications in military, industrial, emergency and more conditions. We also focus on bio-medical equipment, chemical sensors, Vacuum-UV, sterilizers, and concentrators of bacteria and virus such as Foot-mouth disease, MERS (Middle East Respiratory Syndrome), mutated influenza. It is our goal to create clean environment for everybody to live for the 21st century and we are very proud of our achievements and mission for this goal of creating clean environment for everybody.
<table>
<thead>
<tr>
<th><strong>Company State Table</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Company Name</strong></td>
</tr>
<tr>
<td><strong>Found</strong></td>
</tr>
<tr>
<td><strong>President</strong></td>
</tr>
<tr>
<td><strong>Address</strong></td>
</tr>
<tr>
<td><strong>Patented Technology</strong></td>
</tr>
<tr>
<td><strong>Principal Trade Debtors</strong></td>
</tr>
<tr>
<td><strong>Business Areas</strong></td>
</tr>
</tbody>
</table>
# Company History

<table>
<thead>
<tr>
<th>Year Range</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011 – Current</td>
<td><strong>Growing as a company specializing in Advanced Materials</strong></td>
</tr>
<tr>
<td></td>
<td>Constructed new buildings and moved out</td>
</tr>
<tr>
<td></td>
<td>Company name changed as a Hanso, Inc.,</td>
</tr>
<tr>
<td></td>
<td>Developed activated carbon-based chemi-sorption materials for military applications in production scale first in Korea,</td>
</tr>
<tr>
<td></td>
<td>Selected on the research project used for both military and civilian applications by Defense Acquisition Program Administration,</td>
</tr>
<tr>
<td></td>
<td>Selected on the research project applying military technology for civilian applications by Defense Acquisition Program Administration,</td>
</tr>
<tr>
<td></td>
<td>Be awarded Minister of the Environment,</td>
</tr>
<tr>
<td></td>
<td>Expanded the 2nd manufacturing factory dedicated to advanced materials for reducing environmentally toxic and hazardous materials,</td>
</tr>
<tr>
<td></td>
<td>Got an Investment from Hanyang Engineering Company,</td>
</tr>
<tr>
<td></td>
<td>Got a research contract with Samsung Electronics,</td>
</tr>
<tr>
<td></td>
<td>Developed medical sterilizers using low-temperature plasma.</td>
</tr>
<tr>
<td>2006 – 2010</td>
<td><strong>First Mass-Production in low-temperature catalyst based on metal oxide in Korea</strong></td>
</tr>
<tr>
<td></td>
<td>First Mass-Production in low-temperature catalyst based on metal oxide for reducing VOCs in Korea,</td>
</tr>
<tr>
<td></td>
<td>Provided low-temperature catalyst based on metal oxide for reducing VOCs first to Samsung Electronics,</td>
</tr>
<tr>
<td></td>
<td>Established the 1st manufacturing factory dedicated to advanced materials for reducing environmentally toxic and hazardous materials,</td>
</tr>
<tr>
<td></td>
<td>Successfully commercialized chemical adsorbents for reducing harmful industrial gases.</td>
</tr>
<tr>
<td>2000 – 2005</td>
<td><strong>Founded the company with Samsung Fine Chemical's investment</strong></td>
</tr>
<tr>
<td></td>
<td>Founded Lead Genex, Inc.,</td>
</tr>
<tr>
<td></td>
<td>Established the affiliated Advanced Materials Research Institute,</td>
</tr>
<tr>
<td></td>
<td>Investment of Samsung Fine Chemical and Chong Kun Dang company,</td>
</tr>
<tr>
<td></td>
<td>Nominated as a Company of the Best Venture Class of the Federation of Korean Industrials.</td>
</tr>
</tbody>
</table>
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℃), 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℃), 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 AsH₃, PH₃, SiH₄, H₂S, H₂Se, Cl₂, F₂, BCl₃, HCl, HBr, HF, Amines.

**Chemical Adsorbents based on an Impregnated Activated Carbon/Metal Oxides**
Used for reducing HF, HCl, Cl₂, H₂S, SO₂,
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 C₆H₁₂, NH₃, SO₂, Cl₂, PH₃, HCHO, E0, CS₂, NO₂, Phosphine, Used for the Gas Mask Canisters of Military,
Civil Defense, Disaster and Industrials.

**Research & Development**
Medical Sterilizer, Living Care Sterilizer, Sensor for toxic chemical agents, Portable Biological Particle Concentrator, Sterilization and destruction by Vacuum UV (ultra violet) Radiation.
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**

- **Effective to operate at low-temperature (180-200°C)** 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.
- **Can be operated at 180-200°C with removal efficiency of VOCs/HCs >98.5% with <2,000ppm of VOCs/HCs.**
- **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.
- **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.**
- **Can be used with electricity to elevate system temperature.**
- **No emission of toxic by-products such as NOₓ from catalytic reactions.**
- **Can be disposed as no-toxic materials after catalytic use due to non-toxic metal oxides.**

**Total Turn-Key System Advantage**

- **Low cost-of-ownership in operation**
- **High efficiency of reducing toxic gases**
- **Built-in excellent safety system**
- **Easy to operate**
- **Environmentally friendly**

**Low-Temperature Catalyst System Configuration**

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

Schematic Diagram
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 (ø=3.3, more)
- Colour: Dark brown
- Bulk density: 0.69~0.72g/cc
- Crush strength: > 4.0kgf/cm²
- Recomm. operating temp.: 25~240°C
- Upper temp. limit: < 340°C

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>TVOCs / Total Volatile Organic Compounds</td>
<td>VOCs + O₂ → xCO₂ + yH₂O</td>
</tr>
<tr>
<td>THC / Total Hydro Carbons</td>
<td>CₓHᵧ + O₂ → xCO₂ + yH₂O</td>
</tr>
</tbody>
</table>

**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 (ø=3.3, more)
- Colour: Dark brown
- Bulk density: 0.69~0.72g/cc
- Crush strength: > 4.0kgf/cm²
- Recomm. operating temp.: 80~160°C
- Upper temp. limit: < 340°C

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO / Carbon Monoxide</td>
<td>xCO + O₂ → xCO₂</td>
</tr>
</tbody>
</table>
HS-CO (Granule Type)

Application Field

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

Characteristic

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

Mechanism

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO / Carbon Monoxide</td>
<td>xCO + O₂ → xCO₂</td>
</tr>
</tbody>
</table>

Test Example

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

![Graph showing CO conversion over time]

Time on stream (min)

CO conversion (%)
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)
- Colour : Dark brown
- Bulk density : 0.69~0.72g/cc
- Crush strength : > 4.0kgf/cm²
- Recomm. operating temp. : 25~160℃
- Upper temp. limit : < 340℃

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₃ / Ozone</td>
<td>2O₃ + O₂ → 4O₂</td>
</tr>
</tbody>
</table>

X-NOₓ (for reducing NOₓ)

**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)
- Colour : Dark brown
- Bulk density : 0.69~0.72g/cc
- Crush strength : > 4.0kgf/cm²
- Recomm. operating temp. : 180~220℃
- Upper temp. limit : < 340℃

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOₓ</td>
<td>4NO + 4NH₃ + O₂ → 4N₂ + 6H₂O</td>
</tr>
</tbody>
</table>
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: 200x200x50~100mm
- Colour: Dark gray
- Cell density: 200cpsi~400cpsi

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>TVOCs / Total Volatile Organic Compounds</td>
<td>$\text{VOCs} + \text{O}_2 \rightarrow \text{xCO}_2 + \text{yH}_2\text{O}$</td>
</tr>
<tr>
<td>THCs / Total Hydro Carbons</td>
<td>$\text{CxHy} + \text{O}_2 \rightarrow \text{xCO}_2 + \text{yH}_2\text{O}$</td>
</tr>
</tbody>
</table>

**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: 200x200x50~100mm
- Colour: Dark gray
- Cell density: 100cpsi~400cpsi

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO / Carbon Monoxide</td>
<td>$\text{xCO} + \text{O}_2 \rightarrow \text{xCO}_2$</td>
</tr>
</tbody>
</table>

**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: 200x200x50~100mm
- Colour: Black
- Cell density: 200cpsi~400cpsi

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₃ / Ozone</td>
<td>$2\text{O}_3 + \text{O}_2 \rightarrow 4\text{O}_2$</td>
</tr>
</tbody>
</table>
**HS-NOx (for reducing NOx)**

**Application Field**

**Characteristic**
- Appearance & Size: Pellet (ø=3.0, more)
- Colour: light beige
- Bulk density: 0.73~0.75g/cc
- Crush strength: > 1.0kgf/cm²
- Recom. operating temp.: 260~400°C
- Upper temp. limit: < 400°C

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$</td>
</tr>
</tbody>
</table>

**HS-NOx (for reducing NOx)**

**Application Field**

**Characteristic**
- Appearance: Honeycomb
- Standard Size: 200x200x50~100mm
- Colour: Bluish green
- Cell density: 100cpsi~400cpsi
- Recom. operating temp.: 260~400°C

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$</td>
</tr>
</tbody>
</table>

**HS-PFC (for reducing PFCs)**

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

**Characteristic**
- Appearance & Size: Pellet (ø=3.3, more)
- Colour: Blue, White
- Bulk density: ~0.4g/cc
- Crush strength: > 1.0 kgf/cm²
- Recom. operating temp.: 400~800°C
- Upper temp. limit: < 1,000°C

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>$NF_3$, $CF_4$, $SF_6$</td>
<td>$XF_n + M \rightarrow MF + XO(XO_2)$</td>
</tr>
<tr>
<td>$XF_n + H_2O \rightarrow HF + XO(XO_2)$</td>
<td></td>
</tr>
</tbody>
</table>
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 (φ=4.0, more)
- Colour : Brown
- Bulk density : 0.6~0.7g/cc
- Crush strength : > 4kg/cm²
- Upper temp. limit : < 100°C

Mechanism

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
<th>TLV (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCl₃</td>
<td>BCl₃ + 3MOH → 3MCl + B(OH)₃</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>BCl₃ + 3MO(OH) → 3MOCl + B(OH)</td>
<td></td>
</tr>
<tr>
<td>HBr</td>
<td>2HBr + M(OH)₂ → MBr₂ + 2H₂O</td>
<td>3</td>
</tr>
<tr>
<td>HCl</td>
<td>3HCl + MO(OH) → MCl₃ + 2H₂O</td>
<td>5</td>
</tr>
<tr>
<td>HF</td>
<td>6HF + M₂O₃ → 2MF₃ + 3H₂O</td>
<td>3</td>
</tr>
<tr>
<td>SiH₄</td>
<td>SiH₄ + 2MOH → M₂Si + 2H₂O + H₂</td>
<td>5</td>
</tr>
</tbody>
</table>

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 (φ=2.2, more)
Colour : White
Bulk density : 0.6~0.7g/cc
Crush strength : > 2.0kg/cm²
Upper temp. limit : < 100°C

Mechanism

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
<th>TLV (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl₂</td>
<td>Cl₂ + 2MOH → 2MCl + H₂O + 1/2O₂</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Cl₂ + M(OH)₂ → MCl₂ + H₂O + 1/2O₂</td>
<td></td>
</tr>
</tbody>
</table>
### X-Amines

**Application Field**

Diffusion Process, Chemical Vapor Deposition (CVD), Process, For reducing of Alkaline Gases such as NH₃, TMA, Amino-Silane, etc.

**Characteristic**

- Appearance & Size: Pellet (ø=4.0, more)
- Colour: Light brown
- Bulk density: 0.8g/cc
- Crush strength: > 2.0kg/cm²
- Upper temp. limit: < 100°C

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
<th>TLV (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH₃</td>
<td>4NH₃ + MSO₄ → M(NH₃)₂SO₄</td>
<td>25</td>
</tr>
</tbody>
</table>

### X-H₂S

**Application Field**

Diffusion Process, Chemical Vapor Deposition (CVD), Process, For reducing of Acid Gases, H₂S, H₂Se, PH₃, AsH₃, B₂H₆, etc.

**Characteristic**

- Appearance & Size: Pellet (ø=3.0, more)
- Colour: Light blue
- Bulk density: 0.8g/cc
- Crush strength: > 2.0kg/cm²
- Upper temp. limit: < 50°C

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
<th>TLV (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₂S</td>
<td>Cu(OH)₂ + H₂S → CuHS + 2H₂O</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>2Cu(OH)₂ + H₂S → Cu₂S + 4H₂O</td>
<td></td>
</tr>
</tbody>
</table>

### X-SiH₄

**Application Field**

Ion Implant Process, Ashing and Etching Process, Epi Process, Some Chemical Vapor Deposition (CVD), Process, For reducing of SiH₄ gas, etc.

**Characteristic**

- Appearance & Size: Pellet (ø=3.0, more)
- Colour: Purple
- Bulk density: 0.70~0.75g/cc
- Crush strength: > 2.0kg/cm²
- Upper temp. limit: < 100°C

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
<th>TLV (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SiH₄</td>
<td>SiH₄ + 2MOH → M₂Si + 2H₂O + H₂</td>
<td>5</td>
</tr>
</tbody>
</table>
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)
- Colour: Black
- Bulk density: 0.60~0.65g/cc
- Crush strength: > 4.0kgf/cm²
- Upper temp. limit: < 100°C

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
<th>TLV (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCl</td>
<td>3HCl + MO(OH) → MOCl₂ + 2H₂O</td>
<td>5</td>
</tr>
<tr>
<td>Cl₂</td>
<td>Cl₂ + 2MOH → 2MCl₂ + H₂O + 1/2O₂</td>
<td>1</td>
</tr>
<tr>
<td>H₂S</td>
<td>Me(OH)₂ + H₂S → MeHS + 2H₂O</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>2Me(OH)₂ + H₂S → Me₂S + 4H₂O</td>
<td></td>
</tr>
</tbody>
</table>

**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
Application Field

For Gas Mask Canisters of Military, Civil Defense and Industrials, For Reducing Toxic Industrial Chemicals (TICs) such as C₆H₁₂, NH₃, SO₂, HCl, H₂S, CS₂, PH₃, HCHO, NO₂.
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
- Colour : Black
- Bulk density : 0.45~0.48g/cc
- Total pore volume : 0.7cm³/g
- Upper temp. limit : < 150°C

Mechanism

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
<th>Minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNCl</td>
<td>CNCl + H₂O → HOCN + HCl, CNCl + H₂O → HOCl + HCN</td>
<td>&gt;55</td>
</tr>
<tr>
<td>HCN</td>
<td>2HCN + ZnO → Zn(CN)₂(s) + H₂O, 4HCN(g) + 2CuO → 2Cu(CN)(s) + (CN)₂(g) + 2H₂O (CN)₂(g) + 2H₂O → (CONH₂)(g)</td>
<td>&gt;28</td>
</tr>
</tbody>
</table>

Test Example

Test Gas : H₂S 5,000ppm in N₂
Flow Rate : 100cc/min
Cat. Wt. : 0.5g
HANSO Products : HS-ASZM
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
- Colour: Black
- Bulk density: 0.5~0.6g/cc
- Total pore volume: 0.7cc/g
- Upper temp. limit: < 150°C

Mechanism

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCN</td>
<td>C-CuO + HCN → C-Cu(CN)2, C-CN2 + H2O</td>
</tr>
<tr>
<td>HCl</td>
<td>C-CuO + HCl → C-CuCl2 + H2O</td>
</tr>
<tr>
<td>H2S</td>
<td>C-Cu(OH)2 + H2S → C-CuS + 2H2O</td>
</tr>
<tr>
<td></td>
<td>C=O + H2S → C-S + H2O</td>
</tr>
<tr>
<td>SO2</td>
<td>C-KOH + SO2 → C-K2SO4 + H2O, C-SO−</td>
</tr>
<tr>
<td>NO2</td>
<td>AC + NO2 → CN−, CNO−, CNO3−</td>
</tr>
</tbody>
</table>

Test Example

Test Gas: NO2, HCl, H2S, HCN, SO2
Flow Rate: 295cc/min
Test Wt.: 0.5g
Inlet Conc.: SO2 2,000ppm
NO2, HCl, H2S, HCN 1,000ppm
HS-4TICs (based on impregnated activated carbon)

**Application Field**

For reducing Industrial Toxic Chemicals (TICs) (C₆H₁₂, H₂S, SO₂, Cl₂, etc.)

**Characteristic**

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

**Mechanism**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl₂</td>
<td>C-CuO + Cl₂ → C-CuCl₂ + H₂O</td>
</tr>
<tr>
<td>H₂S</td>
<td>C-Cu(OH)₂ + H₂S → C-CuS + 2H₂O&lt;br&gt; C=O + H₂S → C-S + H₂O</td>
</tr>
<tr>
<td>SO₂</td>
<td>C-KOH + SO₂ → C-K₂SO₄ + H₂O, C-SO⁻</td>
</tr>
</tbody>
</table>

**Test Example**

Test Gas: Cl₂, H₂S, SO₂<br> Flow Rate: 100cc/min<br> Test Wt.: 0.5g<br> 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.

Zeolite type

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

Test Example

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

Model: HS-VC20

**Characteristic**

- Low-temperature plasma sterilization
- Short time effective sterilization
- Environmentally friendly Sterilizing agent
- Oil-free vacuum pump with no worry on oil contamination at emergency and Low COO (cost-of-ownership)
- Operation and maintenance by large volume of sterilant (sterilizing agent) and Hepa® filter
- Maximized sterilization by effective delivery of sterilizing agent by turbulent flow
- Flexible sterilization capability on size of medical tools and devices thanks to large sterilization chamber (20 liters)
- Affordable economical price

**HS-VC20 SPECIFICATION SHEET**

<table>
<thead>
<tr>
<th>Cycle Time (less than 55±5℃)</th>
<th>Standard</th>
<th>Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30±5 minutes(Short lumen)</td>
<td>60±5 minutes(Long lumen)</td>
</tr>
<tr>
<td>Sterilizer Size</td>
<td>625mm(W) x 630mm(H) x 485mm(L)</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>55 Kg</td>
<td></td>
</tr>
<tr>
<td>Sterilization chamber Size</td>
<td>Ø300mm x 300mm(L)</td>
<td></td>
</tr>
<tr>
<td>Volume</td>
<td>20 Liters</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Cylindrical(SUS 304/316)</td>
<td></td>
</tr>
<tr>
<td>Sterilization agent</td>
<td>Hydrogen peroxide(50 %), (20 cycles/Bottle)</td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>220~230 V, 50/60 Hz, Single phase, 1.1 Kw(Max.)</td>
<td></td>
</tr>
<tr>
<td>Ambient environment</td>
<td>10<del>40 ℃, 10</del>90 RH%(Non-condensing)</td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td>Embedded(57mm Thermal Paper)</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>USB memory</td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>128x32 Dots</td>
<td></td>
</tr>
<tr>
<td>Installation environment</td>
<td>- Front: 600mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Rear: 100mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Upper: 100mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Left, Right: 100mm</td>
<td></td>
</tr>
</tbody>
</table>
Living Care Sterilizer

Model : HS-VHP

Applications
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, H2O2) to equipment and devices being sterilized
- Wide of range of sterilization such as MERS, SARS, Ebola, super-bacteria and micro organism
Sensor for toxic chemical agents

Model: HS-CWS

CWA Detection Fiber Patch Pattern

Liquid Phase Test Results

Gas Phase Test Results

Simulated Fiber Patch Test Results
Portable Biological Particle Concentrator

Model : HS-BVC

Applications

- 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)
Sterilization and destruction by Vacuum UV (ultra violet) Radiation

Model : HS-VHR

Applications
- Sterilization and destruction of virus, bacteria and toxic gases

Characteristic
- Sterilization by vacuum UV