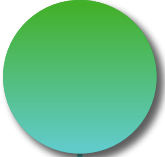


# Engineered Gas Filtration Media Performance and Treatment Capabilities in Different Applications

*Irene Merino Jiménez*





At **BION**, we are air filtration **experts** offering **clean air solutions** for over **25 years**.

# BION around the WORLD

A world map with a green-to-blue color gradient. The map highlights four regional offices of BION with callout boxes and circular logos. The callout boxes are green with white text. The circular logos are blue with a green border and the word 'BION' in white. The map shows the following locations: BION USA in North America, BION Spain in Europe, BION Middle East in the Middle East, and BION Latam in South America.

**BION USA**  
Atlanta - Georgia



**BION SPAIN**  
Head office and Factory  
Gavà - Barcelona

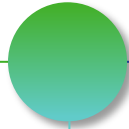


**BION Middle East**  
Kuwait



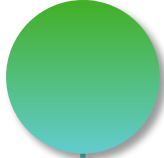
**BION Latam**  
Santiago - Chile





# SUMMARY

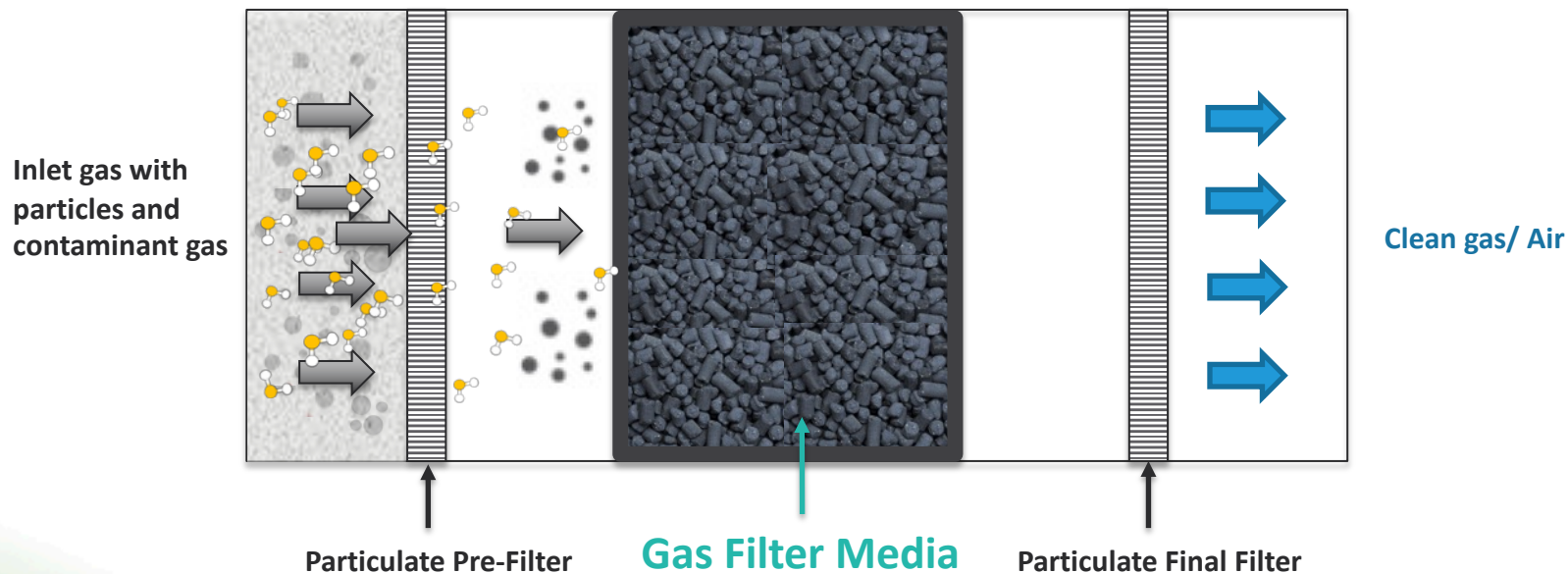
- Dry scrubbing for gas removal
- Dry media working principle
- Types of adsorbent media:
  - Virgin Activated Carbons
  - Impregnated Media
  - Extruded Media
- Main applications
- **Case Study:** Corrosion
- Other success cases

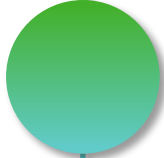


# **DRY SCRUBBING FOR GAS REMOVAL**

*Particles and gas filtration equipment*

# EFFECTIVE REMOVAL OF GASEOUS CONTAMINANTS



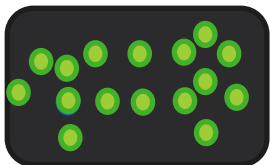


# DRY MEDIA WORKING PRINCIPLE

*Adsorption and Chemical Reaction*

# ABSORPTION vs. ADSORPTION

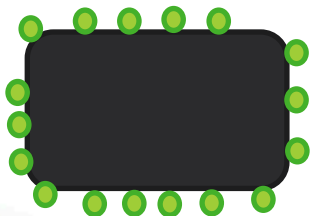
## ABSORPTION



## ABSORPTION

One substrate is taken up into the physical structure of the other substance.

## ADSORPTION



## ADSORPTION

The process in which atoms, ions or molecules from a gas, liquid or dissolved solid (**ADSORBATE**) get attached to a surface of a solid (**ADSORBENT**).

Adsorption versus Absorption





# PHYSICAL ADSORPTION

*The gas molecules are attracted to the solid surface atoms via van der Waals forces.*

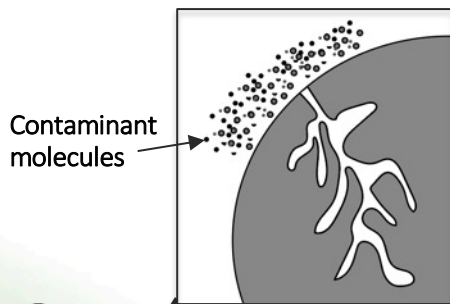


## Activated carbon media

Adsorption capacity is limited by the concentration of the target gas and the porosity of the media.

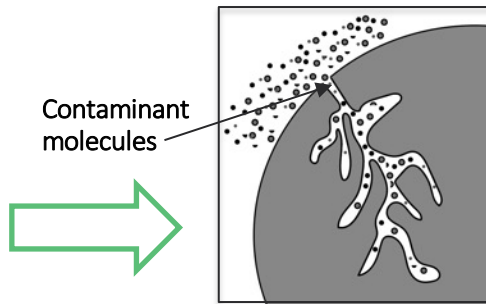
### STEP 1

Diffusion of the gas molecules to the adsorbent surface



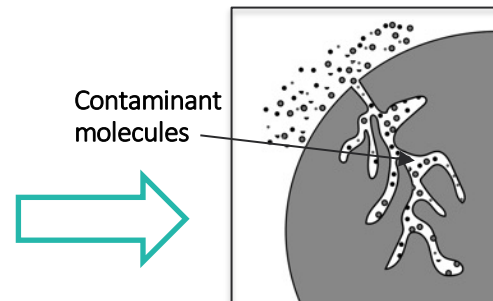
### STEP 2

Mass transfer into adsorbent  
macro-pores > 50 nm, meso-pores  
2-50 nm, micropore < 2nm



### STEP 3

Physical attachment of the  
gas molecules onto the pores  
surface



# CHEMICAL ADSORPTION *IMPREGNATED MEDIA*

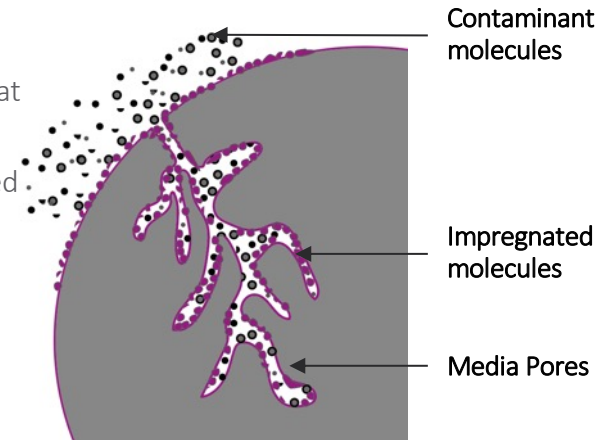
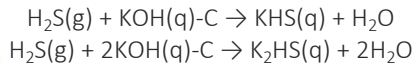
*The gas molecules are held onto the solid surface atoms via chemical bonds*



- Base material: **Activated carbon, alumina, zeolites or silica gel**
- Impregnated chemicals:  $\text{KMnO}_4$ ,  $\text{KOH}$ ,  $\text{HPO}_3$
- Gas eliminated by **chemical reaction** with the chemical compound impregnated at the surface of the adsorbent.
- Adsorption capacity is limited by the amount of chemical compound impregnated and the porosity of the media.

## EXAMPLES

$\text{H}_2\text{S}$  elimination with  $\text{KOH}$  impregnated media:



# CHEMICAL ADSORPTION CATALYTIC MEDIA

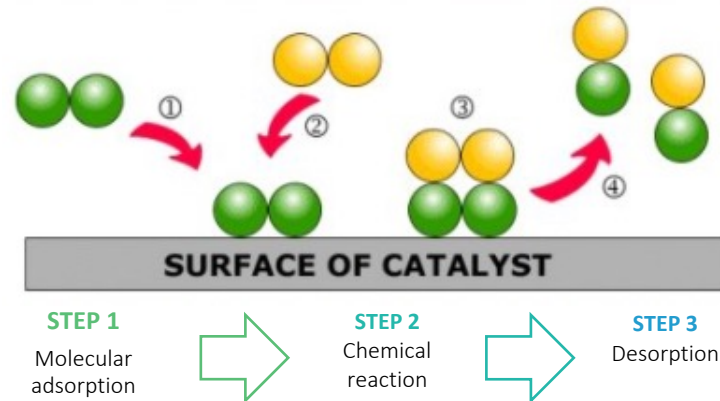
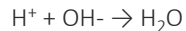
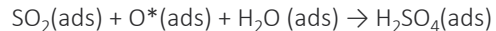
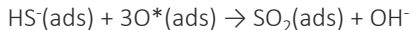
*The gas molecules are eliminated by chemical reaction at the catalyst surface*

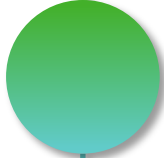


- Base material: **Activated carbon**, alumina, zeolites or silica gel
- Mixed with **inorganic catalysts**: silica, alumina, iron oxide, calcium oxide and magnesia
- Very high adsorption capacity

## EXAMPLES

H<sub>2</sub>S oxidation to elemental sulfur in the presence of oxygen and a catalytic media:





# **TYPES OF ADSORBENT MEDIA**

*Virgin, impregnated and extruded*

# WIDE RANGE OF MEDIA

*A complete range of gas phase filtration solutions*









# OUR MEDIA ENGINEERED SOLUTIONS

H<sub>2</sub>S

SO<sub>2</sub>

VOCs

NOX

Media Type	Active Ingredient	Target Gases
 <b>BION ISORB</b>	Potassium permanganate	H <sub>2</sub> S, SO <sub>2</sub> , Nox, formaldehyde, ethylene, other corrosive gases, low molecular weight VOCs
 <b>BION SORB</b>	Potassium permanganate	H <sub>2</sub> S, SO <sub>2</sub> , Nox, formaldehyde, ethylene, other corrosive gases, low molecular weight VOCs
 <b>BION R</b>	Potassium permanganate	Ethylene, ethanol, methanol, formaldehyde
 <b>BION CLEAR</b>	Sodium Thiosulfate	Chlorine
 <b>BION SIGMA</b>	Iron Hydroxide	H <sub>2</sub> S
 <b>BION BLENDS</b>	According to blend	Wide range of gases depending on the media contained in the BLEND







# OUR CARBON BASED ENGINEERED SOLUTIONS

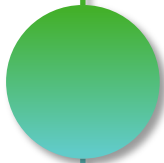
NH<sub>3</sub>

SO<sub>2</sub>

NH<sub>3</sub>

H<sub>2</sub>S

Media Type	Active Ingredient	Target Gases
 <b>BION CARB</b>	Catalytic Compound	H <sub>2</sub> S, Mercaptans, low molecular weight VOCs
 <b>BION ACPA</b>	H <sub>3</sub> PO <sub>4</sub> , Phosphoric acid	NH <sub>3</sub> , Basic gases, Amines
 <b>BION OXYL</b>	KOH, Potassium Hydroxide	H <sub>2</sub> S, Mercaptans, Acid gases, NO <sub>2</sub> , SO <sub>2</sub>
 <b>BION DELTA</b>	KI, Potassium iodide	Aldehydes, Ketones ,Mercaptanes, DMSO,H <sub>2</sub> S
 <b>BION DOD</b>	KOH + KI, Potassium Hydroxide and potassium iodide	H <sub>2</sub> S, Mercaptans
 <b>BION AC</b>	No	VOCs of high molecular weight, such as terpenes, hydrocarbons, toluene



# APPLICATIONS



## MAIN APPLICATIONS

### CORROSION



Protecting electrical equipment from corrosive gases in control rooms.

Purifying air in office areas.

- Oil and gas Industry
- Pulp and paper Industry
- Mining industry
- Chemical industry



### ODOR CONTROL



Purifying exiting gases from odours, protecting people from toxic gases.

- Wastewater treatment plants
- Landfills
- Organic waste from commercial buildings



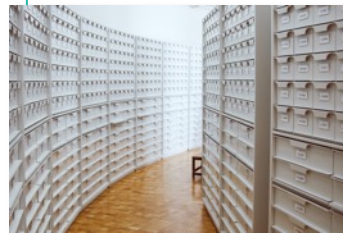
### IAQ



Protecting priceless artifacts, paintings, and archives against odors and harmful gases.

Removing airborne molecular contamination.

- Museums
- Libraries
- Galleries
- Churches



### BIOGAS



Protecting biogas upgrading equipment (membranes).

Purifying up to required levels for grid specifications (99,5%).

Protects CHP engines from corrosive gases.

- Gas to Grid
- Gas to vehicle
- Gas to CHP



## SPECIFIC APPLICATIONS

### EMERGENCY GAS LEAK



Protecting workers from accidental escape of harmful gases at production plants.

- Wastewater treatment plants
- Chemical Industry



### POST-HARVEST



Ethylene Removal:  
Extending the life of fruits and vegetables.

- Climacteric fruits plantations
- Non climacteric fruit plantations
- Flowers



### MARIJUANA GREENHOUSES



For indoor grow to protect the crop from contaminant gases.

Mitigating odor (health issue, allergies). Protecting the environment: terpenes may react with combustion gases to form ozone.

Cannabis emit high levels of terpenes (pungent odor) during the cutting phase.



### CLINICS, LABS AND HOSPITALS



Clean air conditions of laboratory and incubators.

Atmospheric gas and particulate matter may affect pregnancy rates in human IVF programs.

Positive pressure systems installation in laboratory and clean rooms.



A decorative graphic consisting of a solid green circle with a slight gradient, positioned on the left side of the slide. A thin, dark green vertical line extends from the top of the circle to the top of the slide, and another thin, light green vertical line extends from the bottom of the circle to the bottom of the slide.

## **CASE STUDY:** **CORROSION CASE**

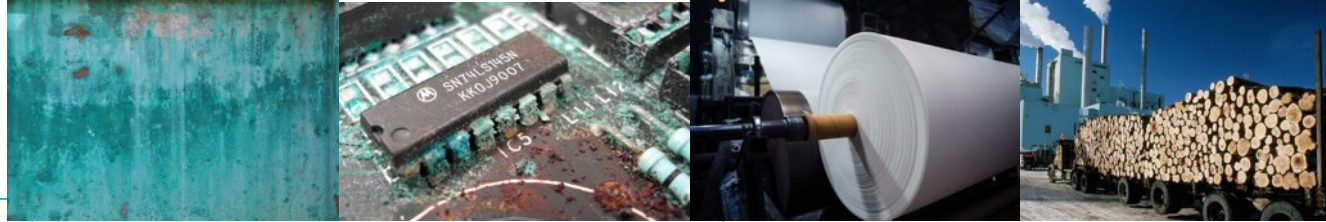
*Pulp & Paper Industry*

*Geothermal Industry*

# INTRODUCTION TO CORROSION

## CORROSION

Corrosion is the gradual destruction of materials (usually metals) by chemical reaction with gases at the environment



- **Main pollutants:**

$\text{H}_2\text{S}$ ,  $\text{SO}_2$ ,  $\text{SO}_3$ ,  $\text{Cl}_2$ ,  $\text{HCl}$ ,  $\text{NO}$ ,  $\text{NO}_2$ ,  $\text{O}_3$ ,  $\text{NH}_3$ ,  $\text{HF}$ ...

- Low Concentrations: 1 – 1000 ppb

- Corrosion attacks the process control systems. It can cause shutdowns, malfunctions and high costs.

# CORROSION MANAGEMENT - PREVENTION

## TEMPERATURE CONTROL

Computer manufacturers advice: 70°+/- 2°F (21°C +/- 1°C)

ISA Standard suggests that **corrosion rates could double** for each 10°C increase in temperature.

## RELATIVE HUMIDITY CONTROL

< 55% Relative Humidity (with < 6% Change/Hour).

ISA class level expected to increase one class for each 10% increase in relative humidity above 50%.

Fluctuating humidity greater than ± 6% per hour cause an increase in the classification level.

## POSITIVE PRESSURE

Construction and Integrity: Well Sealed Room; Airlock Entryways

Room Air Purification: Pressurize the room to 0.05-0.10 IWG with Clean Air ( 3 to 6 air changes/hour)

Room Air Recirculation (6 to 12 air changes per hour).

## Cu/Ag COUPON TEST

Environmental classification  
ANSI/ISA 71.04.2013  
G1 to GX corrosive atmosphere



## CHEMICAL FILTERS

Ensure media replacement when needed.

## SUCCESS CASE, *CORROSION*

*Pulp and Paper Industry, UPM Fray Bentos, Uruguay*

### THE PROBLEM

1.3 M Tn per year of bleached eucalyptus staple cellulose for the manufacture of glossy paper and tissue paper.

Contaminants: H<sub>2</sub>S and SO<sub>2</sub>



### BION SOLUTION: PBS + BION MEDIA

PBS (Parallel Bed Scrubber) equipment to avoid the deterioration of electrical components due to the effects of corrosion.

From 2 year media replacement to 4 year media replacement

PBS



BION ISORB



BION DOD



## SUCCESS CASE, *CORROSION*

### *Geothermal Energy Plant, Philippines*

#### THE PROBLEM

- Improve the air quality in 3 rooms (27 to 235m<sup>3</sup>)
- Contaminants: H<sub>2</sub>S and SO<sub>2</sub>
- G2 level on the ANSI/ISA-71.04-2013:
  - Measurable corrosion in electronics and electrical equipment and may result in downtime of the plant and possibly safety issues.



#### BION SOLUTION: PP & RU

PP & RU: Positive Pressure and recirculation Units to ensure effective contaminants removal.

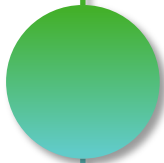
Decrease to G1 level.

PP & RU



Continuous monitoring of the air quality and the overpressure of the rooms using Environmental Monitoring.





## **OTHER SUCCESS CASES**



## SUCCESS CASE, *ODOR*

### ROPEC WWTP Ottawa

#### THE PROBLEM

The ROPEC WWTP treats an average of 390 M liters wastewater per day, generating 39 tons of dry biosolids per day, which are used as agricultural fertilizer.

Contaminants: Volatile organic compounds (VOCs), H<sub>2</sub>S, sulfur compounds, NH<sub>3</sub>, mercaptans and others.



#### BION SOLUTION: BION MEDIA

The use of media for each área:  
pre-treatment and biosolids area.

BION CARB DELTA

PRE-TREATMENT AREA



BION CARB DELTA

BIOSOLIDS AREA



75%

BION ACPA

BIOSOLIDS AREA



25%

## SUCCESS CASE, *BIOGAS*

*Honouliuli Wastewater renewable natural gas (RNG) plant*

### THE PROBLEM

Biogas from two anaerobic digesters is processed and upgraded to be injected into the pipeline to provide thermal energy for homes and businesses.

800,000 therms of energy per year, enough gas for 6,000 homes.

Contaminants: H<sub>2</sub>S and VOC.



### BION SOLUTION: LLS + BION MEDIA

- lead lag system
- 2 types of media in each vessel:
  - BION CARB BG high capacity H<sub>2</sub>S removal
  - BION AC for VOCs removal
- Proportion adapted to the gas concentrations and lead lag to ensure maximum efficiency to maximize output and minimize operation costs.

LLS



BION CARB BG



BION AC





## QUESTIONS? CONTACT US



[www.bioconservacion.com](http://www.bioconservacion.com)



[info@bioconservacion.com](mailto:info@bioconservacion.com)



+34 936 623 254 / +34 932 371 362

