

Activated Carbon for the Removal of Hydrogen Sulphide

DESOREX®

Hydrogen Sulphide and Mercaptane Removal

Hydrogen sulphide and mercaptanes can be removed from gas by different types of activated carbon. The selection of the most suitable process and the related activated carbon type is difficult and depends on the chemical composition of the gas as well as on the physical parameters such as humidity and temperature.

In general three different types of activated carbon can be chosen:

- KI-impregnated activated carbon,
- NaOH-impregnated activated carbon or
- Catalytical activated carbon.

For the selection of the best activated carbon type some hints are given on the following pages.

Temperature of the gas

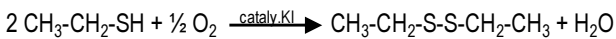
- preferable temperatures of 10 – 70°C
- < 10°C extension of the working layer
=> lower loading of elemental sulfur
- > 70°C causes formation of by-products
=> SO₂ and H₂SO₄ formation
=> corrosion problems in the downstream equipment



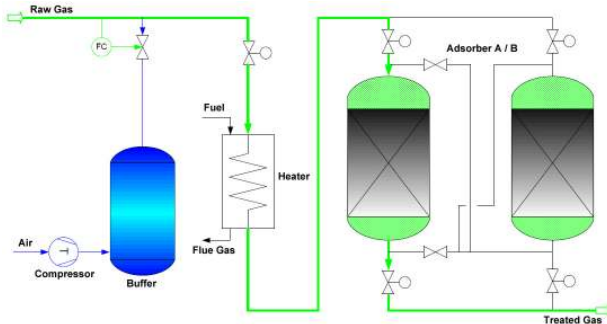
KI impregnated activated carbon

The presence of 2-fold stoichiometric value Oxygen is necessary to realise the transformation from hydrogen sulphide to elemental sulphur. The precondition for a high loading of elemental sulphur is a sufficient mixture. Heating of the gas is necessary when the relative humidity is more than 60 – 70%.

The conversion of H₂S and mercaptans into elemental sulphur occurs inside the pore structure through catalytic oxidation.



Process-Flowchart



Oxygen demand

- Optimal rate between H₂S / O₂
=> A factor of 1,7 times the stoichiometric value
- If the air flow interrupted irreversible damage to the carbon bed occurs.
- This damage cannot be reversed by the injection of more air.

Data Sheet Desorex® K 43 J Cylindrically shaped activated carbon, bituminous coal (potassium iodide impregnated)

Specifications:

Impregnation (wt.%)	approx. 2
Bulk density (kg/m ³)	480 ± 30
Moisture content (wt.%) (as packed)	< 10

Product data before impregnation:

Total surface area (m ² /g) (BET-method)	950
Diameter of particles (mm)	4
CTC-adsorption (wt.%)	60
Benzene adsorption in air at 20°C (wt.%)	
p/pS*	0.9 > 38
	0.1 > 34

*p/pS = relative saturation (concentration of saturation at 20°C, 320 g/m³)

Data Sheet Desorex® K 43 Na Cylindrically shaped activated carbon, bituminous coal (NaOH impregnated)

Specifications:

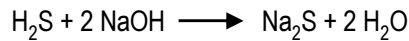
Impregnation (wt.%)	approx. 10
Bulk density (kg/m ³)	580 ± 30
Moisture content (wt.%) (as packed)	< 15
Diameter of particles (mm)	4

Product data before impregnation:

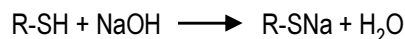
Total surface area (m ² /g) (BET-method)	950
CTC-adsorption (wt.%)	> 60

NaOH impregnated activated carbon

The use of activated carbon impregnated with caustic soda does not require an oxygen content of the gas. The removal of H₂S is a chemisorptive process which is described by the following equation:



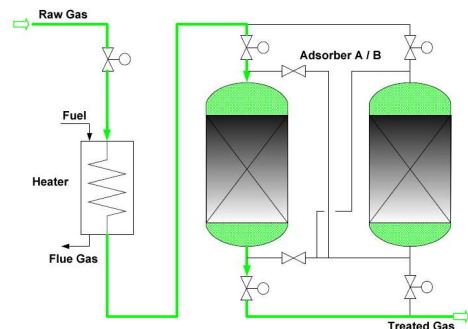
It easily can be seen that the caustic soda is used to neutralise the acidic hydrogen sulphide. The adsorption capacity is limited to the amount of NaOH which also reacts with all other acidic components present in the treated gas. Mercaptanes are converted into their sodium salts according to following equation:



A for the use of KI impregnated activated carbon, the humidity of the gas should not exceed 70%rh.

Instead of NaOH impregnated types also other alkaline impregnants can be used.

Process-Flowchart



Laboratory / application technology consulting

In our own laboratories we prove and evaluate new and used activated carbons utilizing our own analytical methods as well as National and International Test Procedures. Our technical applications are based on decades-long experience in the field of natural gas desulfurization and mercury removal.

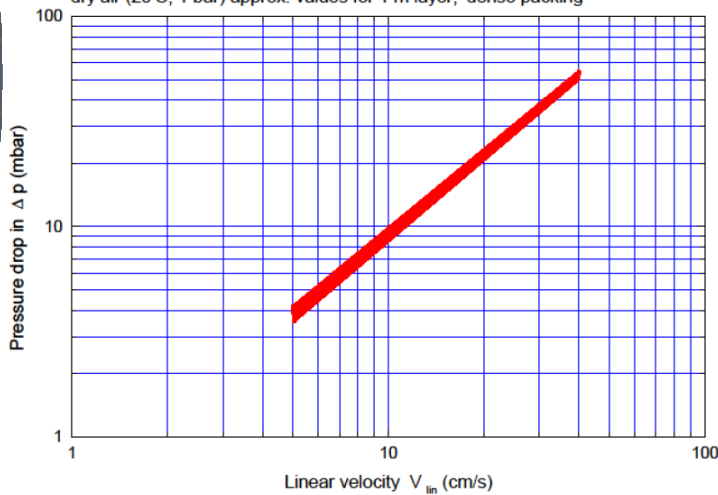
As operators and plant constructors we have developed computer programs which are invaluable in the design and construction of plants and in conducting plant lifetime analyses.



Pressure drop curves

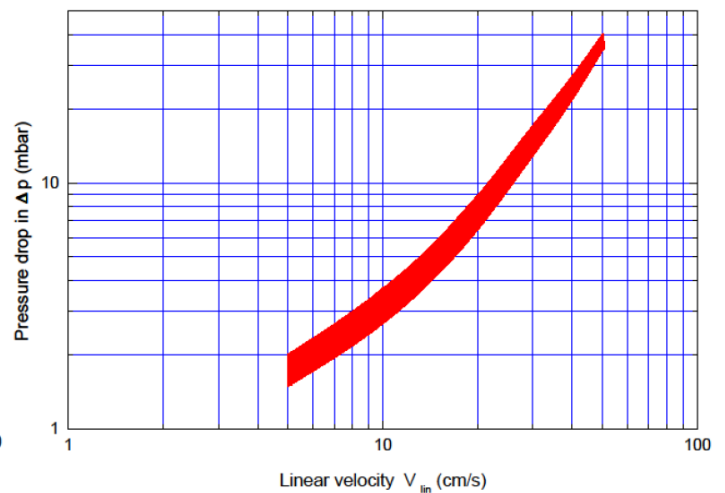
Pressure Drop of 2 mm Cylindrical Activated Carbon

dry air (20°C; 1 bar) approx. values for 1 m layer, dense packing



Pressure Drop of 4 mm Cylindrical Activated Carbon

dry air (20°C; 1 bar) approx. values for 1 m layer, dense packing



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