PRZEDSIĘBIORSTWO TECHNICZNO - HANDLOWE

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PROMOTOR EKOLOGII

# PRODUCT SPECIFICATION

**Product name: HALOSORB – halloysite bed for filters and biofilters**
**CAS Number: 1332-58-7**
**Chemical formula: $Al_2Si_2O_5(OH)_4 \cdot 2H_2O$**
**Formula weight: 294,19 g/mol**
Appearance (Color): beige
Appearance (Form) : calcined granulate 2-10 mm
BHT Surface Area : 65 $m^2/g$
Porosity: 65-75%
Moisture: 1-2%
Bulk density : 650-850 $kg/m^3$
pH : 6,5-7,5
Composition: The granulate consists of mixture of nanotubes and nanoplatelets (Fig. 1)

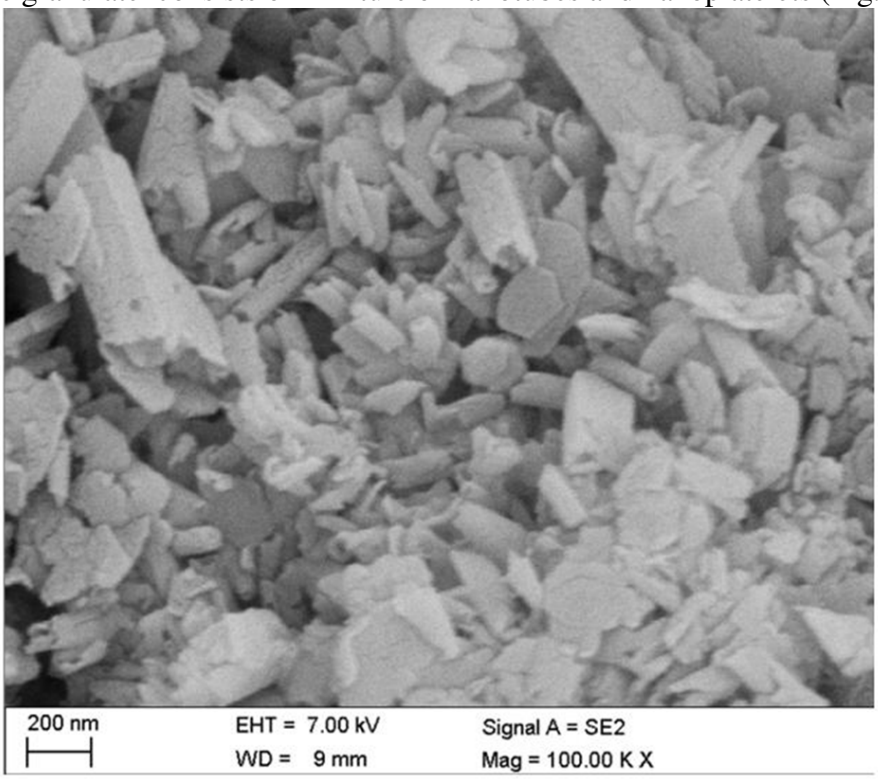


Fig. 1 Microscopic SEM view of the Halosorb grain

Dimensions of nanoparticles:

nanotubes:
diameter: 30-100 nanometers ; length : 0,5 -2 mikrometers
nanoplatelets:
lenght/ width : 100-300 nanometers; thickness : 1-5 nanometers

Supplier : PTH Intermark

Chemical composition:

$Al_2O_3$- 34 +/- 1%;
$SiO_2$- 37 +/- 1%,
$Fe_2O_3$- 21 +/- 1%,
$TiO_2$- 2,5 +/- 1%,
CaO- 0,5% +/-0,1%
$K_2O$ – 0,07+/- 0,01%
$Na_2O$ -0,02%+/- 0,01%
$SO_3$ – 0,05+/-0,02%
Cl <0,01%
LOI – 14,2%

PTH Intermark warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. For further inquiries, please contact PTH Intermark. Purchaser must determine the suitability of the product for its particular use.

**Application:**

Halosorb can be applied as a sorption bed for filters and biofilters for the purification of all process gases including process air. It absorbs both the polar and unpolar impurities from the gas.

The main advantages of Halosorb are:

a / high specific surface area (depending on the type of bed, from 60 to approx. 200 $m^2/g$),
b / high total porosity with the pore size ranging from 0.3 nm to 1000 nm, which allows the absorption of a wide range of odorous gases,
c / high mechanical strength and resistance to water and moisture,
d / high chemical resistance (halloysite works in the pH range from 2 to 12),
e / high thermal resistance (it does not change its physicochemical properties up to the temperature of about 1000 C, so far beyond the operating range of filters and biofilters),
f / because halloysite does not contain any harmful additives, the bed can be used as a fertilizer component after completion of its exploitation,
g / in the case of using waste as RDF fuel, halloysite is an excellent combustion additive improving the effectiveness and efficiency of the combustion process, reducing the slagging and fouling of boilers and emissions of harmful compounds.

In general, it can be stated that halloysite filters and biofilters can be used, among others, in in the following cases:

1 / purification of process air polluted with various harmful gases such as hydrogen sulphide, ammonia, amine compounds, mercaptans and a whole range of volatile, harmful organic compounds,
2 / purification of biogas from hydrogen sulphide, siloxanes, ammonia and mercaptans,
3 / purification of other process gases.

The Halosorb bed works immediately after being put into operation.
After inoculation of microorganisms appropriate for a given contamination, the bed is quickly transformed into a biofilter, which extends the sorption capacity to air pollutants specific to a given case.
Halosorb is also insensitive to the change of active surface area caused by the bed moisture. Its specific surface area is always above 60.000 (sixty thousand) [$m^2/dm^3$] and it is worth noting that most of the organic deposits have a specific surface area in the range of 1000-2000 ((one-two thousand [$m^2/m^3$] of deposit)] i.e. Halosorb has a surface area that is several dozen thousand times larger, regardless of the humidity level (a change in the humidity of an organic bed may reduce this surface even several times).
Halosorb beds have been used effectively for many years in composting plants, WWTP, chemical plants, tanneries.

This bed provides good viability and activity for microorganisms, even in the long-term lack of moisture and nutrients. These beds do not require rinsing, it is enough to maintain an appropriate level of humidity and temperature. It was observed that the microorganisms take up the micronutrients and macronutrients directly from the bed. Water and moisture do not weaken the mechanical strength of the sorbent. Halosorb absorbs also heavy metals and wide range of harmful substances.
Fig. 2 shows the sorbent after 7 years of operation.

Fig.2 Sorbent Halosorb after 7 years of operation

Halosorb beds have been used successfully for many years without the need to replace the bed in Poland, Germany and Russia.

Halosorb beds can be used also for hot gases purifying. The purification of gases can also be carried out by catalytic afterburning. In this case Halosorb fulfills two functions: as a mineral absorber and afterburning catalyst.
The halloysite bed can act as a catalyst for the afterburning process at a temperature of 300 to 1300$^{o}$C. It can successfully replace often applied expensive platinum based catalysts.
Effectiveness of the biofilter performance depends, among others, on following process conditions:
- postprocessed gaseous mixtures must be composed of biodegradable components, able to dissolve in the biofilm layer,
- temperature of purified air must be higher than 10$^{o}$C (optimal range 15 – 40$^{o}$C),
- concentration of impurities in purified gas must be confined to 2,5 g/m$^{3}$,
- concentration of dust in the gas must be kept below 10 mg/m$^{3}$,
- the possibly maximal gas humidity (80- 95% of the relative humidity) should be provided,
- volumetric stream of contaminated air through the biofilter void space must be restricted to value less than 150 m$^{3}$/(m$^{2}$h).

Fig. 3 shows Halosorb-biofilters in operation in a Waste Water Treatment Plant.

Fig. 3 Biofilters with Halosorb bed operated in a WWTP