

Filter techniques for selective removal of impurities from drinking-, medicinal- and mineralwater

WATER

GEOTHERMAL ENERGY

TRACER TESTS

POLLUTANTS

FILTER TECHNIQUES

FOOD

RENEWABLE RESOURCES

ISOTOPE

GASES

SOLIDS

ANALYSIS



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accredited according to DIN EN ISO/IEC 17025:2005

Isotopy & Chemistry in Environmental Hydrology & Food



FILTER TECHNOLOGY

Filter technology for selective removal of impurities from drinking-, and mineral- and wastewater

Geogenic and anthropogenic inorganic and organic pollutants endanger our water resources. Water soluble substances, e.g. arsenic, fluoride, uranium, radionuclide or organic carbon compounds can be removed from water by filtration. As the purity of water is of particular request for us, we have been developing and advancing filter systems for mineral-, drinking- as well as waste water for years.

We offer

- Design and conceptualisation of individual filter- and water treatment solutions of various sizes
- Construction of fully automatic filter systems
- Distribution of filter materials (like **hydroFilt®**) for selective removal of inorganic, organic and radioactive pollutants from water



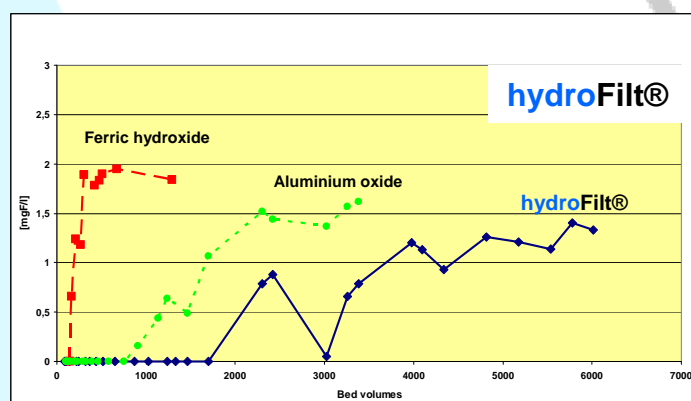
Figure: Filter systems designed for a flow rate of 1 l/s and 50 l/s.

SELECTIVE ELIMINATION

Mainly due to geogenic conditions undesirable substances such as fluoride, arsenic, antimony, uranium, radium and radon may exist in ground water. Such substances can be removed selectively from drinking-, mineral- and waste water by filtration without changing the composition of the water. For individual water ingredients legislation defines certain critical values for drinking-, mineral water and waste water (table p.3). Once critical values are exceeded, the water must be treated.

According to your personal requirements we design and conceptualise filter systems, with the following advantages:

- Highly selective regarding target compounds, i.e. characteristic ion content won't be altered
- Individualized according to your needs
- Fully automatic or semiautomatic system
- Economically efficient





hydroFilt[®]-U

Highly efficient mineral adsorbents for selective elimination of uranium from drinking- and mineral water

hydroFilt[®]-U has been developed particularly for economic and efficient removal of uranium from natural waters.

hydroFilt[®]-U is a pure iron hydroxide granulate produced of ultrapure raw materials. It removes uranium selectively without influencing the main composition of the filtrated water.

hydroFilt[®]-U is perfectly designed for fixed bed filtration.



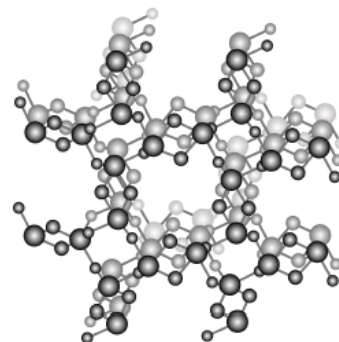
DATA SHEET

Composition and petrophysical parameters

Description	dark brown granulate
Mineralogical composition	b-FeOOH and Fe(OH) ₃
Water content	< 43 - 48%

Physical constants

Grain size	85-90 % 0.32-2 mm ca. 5 % < 0.32 mm 5 - 10 % > 2.00 mm
Grain density	1590 kg/m ³
Total density	1120 -1190 kg/m ³
Grain porosity	72 - 77 %
Specific surface	1,6 x 10 ⁵ m ² /dm ³
Total surface	22 - 28 %



○ Fe³⁺
○ OH⁻
○ O²⁻



hydroFilt[®]-Fluor

Highly efficient mineral adsorbents for selective elimination of fluoride from drinking- and mineral water

hydroFilt[®]-Fluor has been developed particularly for economic and efficient removal of fluoride from natural waters.

hydroFilt[®]-Fluor is a synthetic apatite granulate produced of ultrapure raw materials. It selectively removes fluoride without influencing the main composition and the pH-value of the filtrated water.

hydroFilt[®]-Fluor has excellent adsorption capacities up to 9 gF/kg.



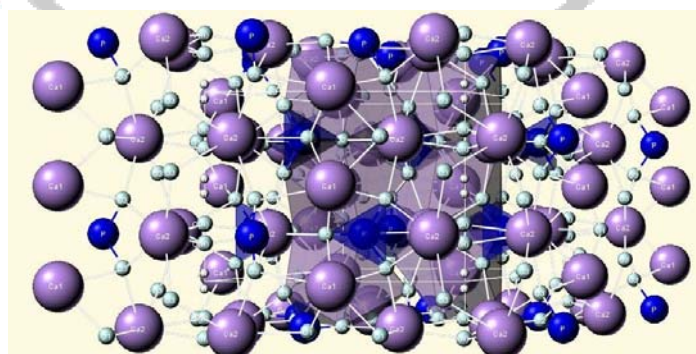
DATASHEET

Composition and petrophysical parameters

Description	colorless, whitish granulate, hardly soluble in water and under alkaline conditions, soluted in thinned acidities
Chemical composition	CaO, P ₂ O, H ₂ O
Mineralogical composition	Apatite > 90 % Tricalciumphosphate Calcite
Physical constants	
Humidity	< 6 %
True density	2200 - 2350 kg/m ³
Apparent density	950 - 1150 kg/m ³
Bulk density	500 - 650 kg/m ³
Particle diameter	> 90 % 0,3 - 3 mm
Packaging	Paper bag with PE-Inliner à 20 kg net weight or in Big Bags

Disposal

Once adsorption capacity is exhausted **hydroFilt[®]-Fluor** can be regenerated for further use without loss of adsorption capacity.





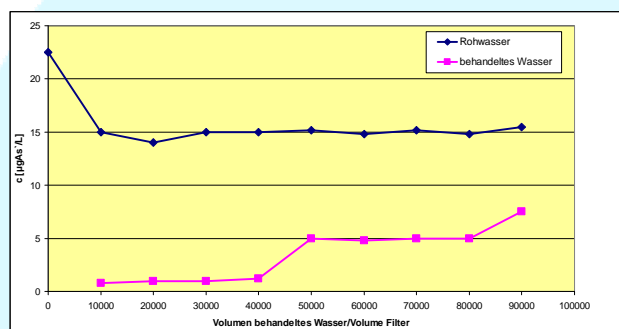
hydroFilt[®]-As

Highly efficient mineral adsorbents for selective elimination of arsenic from drinking- and mineral water

hydroFilt[®]-As has been developed particularly for economic and efficient removal of arsenic from natural waters.

hydroFilt[®]-As is a pure iron hydroxide granulate produced of ultrapure raw materials. It selectively removes arsenic without influencing the main composition of the filtrated water.

hydroFilt[®]-As is perfectly designed for fixed bed filtration.



Operating parameters and ideal service conditions

Maximum bed height	1,6 m
Maximum operating temperature	60°C
Recommended filtration velocity	5 – 20 m/h
Recommendes back-washing velocity at 12°C	26 – 28 m/h
Typical bed expansion at 28 m/h back-flushing	60 %

DATASHEET

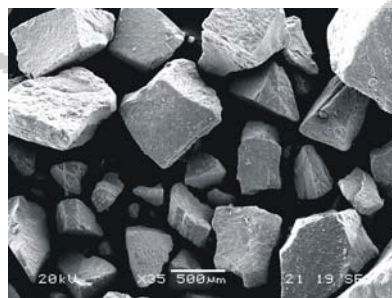
Chemical composition and petrophysical parameters

Description	dark brown granulate
Mineralogical composition	b-FeOOH und Fe(OH) ₃
Water content	< 43 - 48%
Maximum arsenic intake capacity	20 gAs/kg hydroFilt [®] -As

The intake capacity of **hydroFilt[®]-As** depends on pH-value and chemical composition of the water that has to be treated.

Physical constants

Grain size	85-90 % 0.32-2 mm ca. 5 % < 0.32 mm 5 – 10 % > 2.00 mm
Grain density	1590 kg/m ³
Bulk density	1120 -1190 kg/m ³
Grain porosity	72 – 77 %
Specific surface	1,6 x 10 ⁵ m ² /dm ³
Total surface	22 – 28 %





hydroFilt[®]-Ra

Highly efficient mineral adsorbens for selective removal of radium from drinking-and mineral water

hydroFilt[®]-Ra is a special filter material to economically and efficiently remove radium from natural waters. Due to regional geological conditions radium can migrate into ground water making it unsuitable for human consumption. German legislation (TrinkwV (2001), §7, Appendix 3 - Drinking Water Ordinance) defines a maximum total reference dose of 0,1 mSv/a for drinking water.

Applications

- Elimination of radium from water
hydroFilt[®]-Ra has a high selective adsorptivity for radium without emitting undisireable compounds into water. Thus, there is no change in water composition.
- Iron- and manganese removal
Beside the removal of radium the filter material is appropriate for the removal of iron and manganese from ground water due to its high specific surface.

hydroFilt[®]-Ra for removal of Ra, Fe and Mn is cited in the list of materials for treatment and methods for disinfection according to §11 TrinkwV 2001 Chapter III b and will be part of Ib soon.

Mineralogical description

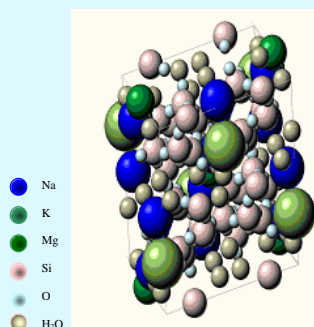
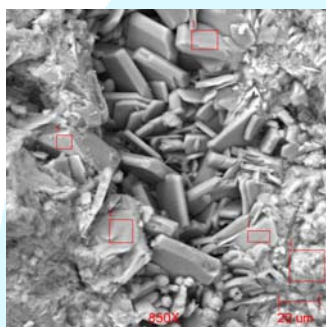
Microscopic analyses of **hydroFilt[®]-Ra** allows characterisation of the material into:

- Clinoptilolite
- Cristobalite
- Feldspar
- Illite

Chemical composition

about 64% silica
about 24% aluminium oxide

Beside these main substances calcium, potassium, iron, magnesium, sodium and titanium are present in the range of %-w/w. Lesser concentrations of the elements sulfur, manganese and strontium are also detectable. Heavy metals are conained in neglibile concentrations. Crystallization water is included with about 5 to 6% in **hydroFilt[®]-Ra**.



hydroFilt[®]-Ra is a natural material mainly consisting of the zeolite clinoptilolite.

hydroFilt[®]-Ra is a special zeolite of the heulandite type. Due to its chemical structure and composition it's particularly appropriate for the removal of radium from water. After mining th material is fractured to the suitable grain sizes for filtration, washed, dried at about 450°C and disinfected.



Filter materials for selective removal

Compound	Method	Filter material	Critical value		
			Drinking water according to TVO mg/l	Mineral water according to TVO mg/l	Waste water according to AbwV mg/l
Fluoride (F)	Filtration	hydroFilt [®] -F	1,5	5 (0,7)	20-50
Nitrate (NO ₃)	Ion exchange		50	50 (10)	
Nitrite (NO ₂)	Ion exchange		0,5	0,1	5
Phosphate (PO ₄)	Filtration	hydroFilt [®] -PO ₄			2
Ammonium (NH ₄)	Filtration	hydroFilt [®] -NH ₄	0,5		20-100
Radium (Ra)	Filtration	hydroFilt [®] -Ra		126	
Radon (Rn)	Degassing				
Uranium (U)	Filtration	hydroFilt [®] -U		X (0,002)	
Iron (Fe)	Filtration	hydroFilt [®] -Fe	0,2		3
Manganese (Mn)	Filtration	hydroFilt [®] -Mn	0,05	0,5 (0,05)	
Arsenic (As)	Filtration	hydroFilt [®] -As	0,01	0,01 (0,005)	0,1
Antimony (Sb)	Filtration	hydroFilt [®] -Sb	0,005	0,005	
Lead (Pb)	Filtration	hydroFilt [®] -Pb	0,01	0,01	0,5
Copper (Cu)	Filtration	hydroFilt [®] -Cu	2	1	0,5
Nickel (Ni)	Filtration	hydroFilt [®] -Ni	0,02		0,5
Chrome (Cr)	Filtration	hydroFilt [®] -Cr	0,05	0,05	0,5
Vanadium (V)	Filtration	hydroFilt [®] -V			
Mercury (Hg)	Filtration	hydroFilt [®] -Hg	0,001	0,001	0,05
Selenium (Se)	Filtration	hydroFilt [®] -Se	0,01	0,01	1
Cadmium (Cd)	Filtration	hydroFilt [®] -Cd	0,005	0,003	0,2
Boron (B)	Filtration	hydroFilt [®] -B			
Silicate (SiO ₂)	Filtration	hydroFilt [®] -Si			
Barium (Ba)	Filtration	hydroFilt [®] -Ba			
Cesium (Cs)	Filtration	hydroFilt [®] -Cs			
Turbidities	Filtration	hydroFilt [®] -Sus	1		
Organic compounds	Filtration	hydroFilt [®] -org			