EVERZIT® As

Filtermaterial EN 15029

Granular Iron (III) hydroxide oxide for effective removal of arsenic from water

General

Due to its chemical activity, Iron (III) hydroxide oxide FeO(OH) is ideally suitable to bind arsenic and other heavy metals in water.

However, the technical application of this universal adsorbent failed in the past due to the fact that iron oxide is usually only available as a paste so that the complicated handling procedure prevented its use in filter columns.

Today, a special process allows the production of iron hydroxide in a granular shape. Moreover, different grain sizes can be produced by grinding and sieving thus leading to many new different fields of application for iron (III) hydroxide.

Due to this important point, various fields of application for the chemical compound EVERZIT® As are arising.

Application areas

At present EVERZIT® As can be usefully applied for following purposes:

- Separation of arsenate ions in drinking water treatment
- Treatment of contaminated ground water during remediation of past pollution
- Retention of contaminants in “reactive barriers”
- Cleaning industrial waste water polluted with heavy metals

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The advantages at a glance

- High cleaning effect at low costs
- High charging performance due to a highly porous surface
- Ecologically favourable due to the use of ferrous side products from water treatment when being produced

Effectivity

In the first step, contaminants in the form of arsenate ions dissolved in water are bound by adsorption to the EVERZIT® As surface. During the subsequent reaction the trans-formation into stable iron arsenate takes place.

Regarding the ions mechanism involving adsorption with subsequent fixation of the heavy metals in an iron hydroxide “crystal lattice is assumed regarding the binding of heavy metal”.

Furthermore, a quite unspecific binding of dissolved organic water pollutants by way of adsorption is also possible.

The following reaction equation represents the simplified transformation of iron hydroxide with arsenate ions:

$$FeO(OH) + H_3AsO_4 \rightarrow FeAsO_4 + 2\ H_2O$$

Iron arsenate

Chemical and physical characteristics

Material	Iron (III) hydroxide oxide
Formula	FeO(OH)
Iron content (Fe^{3+})	min. 33 % (dry based)
Iron (III) hydroxide oxide	min. 51 % (dry based)
Colour	reddish brown
Bulk density	approx. 600 ± 30 kg/m³
Density	1,91 g/cm³
Composition	granular
Specific surface (BET)	min. 300 m²/g
Total Porosity	min. 70 %
Available grain sizes	0,5 – 2,0 mm 2,0 – 4,0 mm
Over- / Undersize particles	each < 10 %
Moisture	approx. 10 % (max. 15 %)

Operating parameters

Filtration rate	approx. 8 – 12 m/h > 12 m/h we propose two filters operating in line
Residence time	5 to 10 bed volumes per hour or 2 x 2,5 minutes in case of 2 filters operating in line
Layer height	In general 1.2 – 1.5 m; up to 5 m possible
Backwash with water	20 m/h; once per week to mix up the filter bed
Head loss	neglible

Note for backwash:

We generally recommend to use an appropriate dual media filter (EVERZIT N and quartzsand) to remove suspended solids, iron and manganese, being pre-positioned to the arsenic filter.

Adsorption capacities

The indicated adsorption capacities were evaluated under ideal conditions. In case of presence of other competing or interfering ions the adsorption capacities are reduced.

The affinity of heavy metals for the adsorption is increasing subsequently:
Co < As < Cu < Ni < Zn < Cd.

Arsenate (+V):	7 – 9 g / kg EVERZIT® As
Phosphorous:	15 – 18 g / kg EVERZIT® As
Copper, Zink:	6 – 10 g / kg EVERZIT® As
Petroleum-derived hydrocarbon:	ca. 20 g / kg EVERZIT® As

Chemical analysis

Element	Chemical symbol	Content in mg/kg TS
Arsenic	As	< 100
Lead	Pb	< 50
Cadmium	Cd	< 1,5
Chromium	Cr	< 10
Cobalt	Co	< 40
Copper	Cu	< 10
Nickel	Ni	< 50
Mercury	Hg	< 0,2
Zinc	Zn	< 100

All data stated in this specification are average values from several measurements without any legally binding effect.

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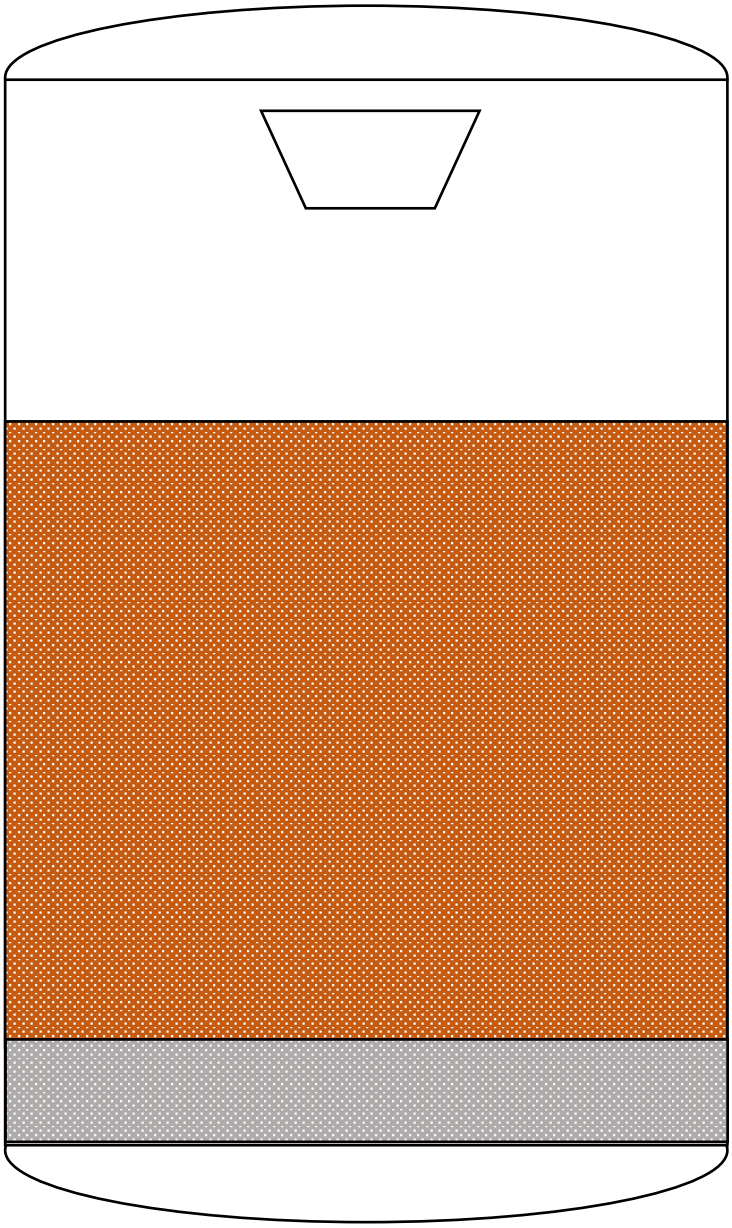
Example of Filter Filling



EVERZIT® As (0,5 – 2,0 mm)

Removal of arsenic and other heavy metals

Support layer

Quartz gravel (2,0 -3,15 mm)

Note

The information given in the info-brochure of Messrs.

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is accurately put together, revised and updated if required. However, we cannot be hold responsible for this information as being up-to-date, exact and complete. Apart from that, this information cannot replace a personal consultation in the specific case.