



KATALYST LIGHT

Filtration of

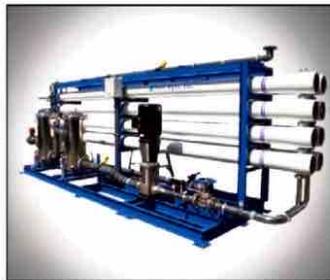
- Less than 3 micron
- Suspended solids
- Sediments
- Turbidity
- Organics
- Color
- Odor

Removal of

- Iron
- Manganese
- Hydrogen Sulfide
- Arsenic
- Radium
- Heavy Metals
- Radionuclides

Advantages

- High content MnO₂ coating (10%)
- Very High Surface Area
- Contains NO Crystalline Silica
- Light Weight - providing significant savings on backwash water
- Higher Filtration rates
- Filtration of sand, sediment and suspended solids, down to 3 micron
- High efficiency removal capacity of Iron, Manganese and Hydrogen sulfide
- Effective reduction of Arsenic, Zinc, Copper, Lead, Radium, Uranium, radionuclides and other heavy metals
- Media replacement every 7 - 10 years
- No disinfection by-product
- No mandatory KMnO₄, chlorine or chlorine dioxide dosing
- Low operational costs
- Unique product, unmatched by our competitors



Introduction

Katalyst Light is formally known as Katalox-Light



Media Description

High content (10%) gamma Manganese dioxide (MnO_2) coated **ZEOSORB**



Katalyst-Light Removal methods:

1. Mechanical Filtration (fine particles, TSS, Turbidity etc.)
2. Catalytic precipitation and sorption (Fe, Mn, Cu, Pb etc.)
3. Adsorption (flocculant formation and adsorption of As, Heavy Metals, Radionuclides)

Filtration ($\leq 3 \mu m$) of:

- ◆ Total Suspended Solids
- ◆ Sediments
- ◆ Turbidity
- ◆ Organics
- ◆ Colour (some, organic)
- ◆ Odour

Removal of:

- ◆ Iron (Inlet conc. up to. 100 mg/L)
- ◆ Manganese (Inlet conc. up to 20 mg/L)
- ◆ Arsenic
- ◆ Hydrogen Sulfide
- ◆ Uranium, Radium
- ◆ Heavy Metals
- ◆ Radionuclide

Best features:

- ◆ WQA Certified to meet ANSI/NSF 61 standard for Drinking Water applications
- ◆ Very high surface area
- ◆ High MnO_2 coating (10%)
- ◆ Contains NO crystalline Silica
- ◆ No mandatory dosing required
- ◆ Light weight media – saves backwash water
- ◆ Replacement frequency every 7-10 years

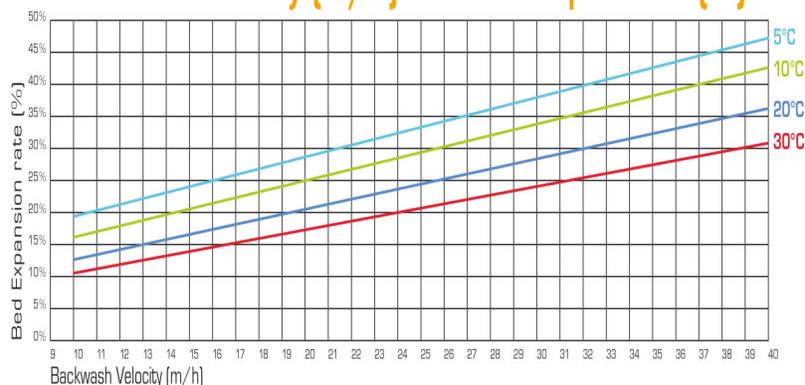


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Master Distributor Watch Water® Products



Backwash Velocity (m/h) vs. Bed Expansion (%)



Composition of Katalyst Light

Compounds	Typical value	Specifications
ZEOSORB (Naturally Mined)	85%	>85%
Manganese dioxide	10%	>9.5%
Hydrated Lime	5%	<5%

Regeneration / Dosing* for 1.0 mg/l of

	Fe ²⁺	Mn ²⁺	H ₂ S
H ₂ O ₂	0.9 mg/l	1.8 mg/l	4.5 mg/l
KMnO ₄ /Cl	1.0 mg/l	2.0 mg/l	5.0 mg/l

* Optional: Only if the water doesn't have sufficient ORP (Oxidation Reduction Potential) to oxidize the contaminants. OXYDES-P helps to keep the media surface clean and could be used during backwash.

Physical Properties

Appearance	Granular black beads	
Odor	none	
Mesh size	US	14 x 30
	SI	0.6 - 1.4 mm
Uniformity Coefficient	≤ 1.75	
Bulk density	US	66 lb / ft ³
	SI	1060 kg / m ³
Moisture Content	<0.5% as shipped	
Filtration	<3 micron	
Loading Capacity	for Fe ²⁺ alone	3000 mg / l 85000 mg / ft ³ (aprx)
	for Mn ²⁺ alone	1500 mg / l 42500 mg / ft ³ (aprx)
Loading Capacity	for H ₂ S alone	500 mg / l 14000 mg / ft ³ (aprx)

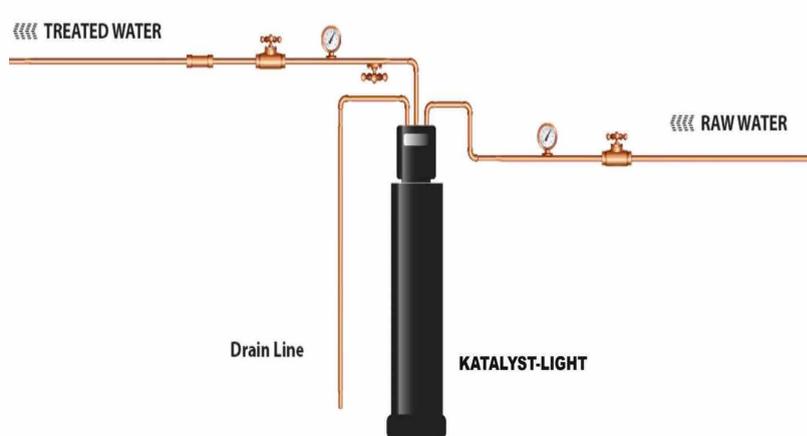
Recommended System Operating Conditions

Inlet water pH	5.8 - 10.5	
Freeboard	40%	
Minimal Bed Depth	US	29.5 inches
	SI	75 cm
Optimal Bed Depth	US	47 inches
	SI	120 cm
Service flow	US	4 - 12 gpm / ft ²
	SI	10 - 30 m/h
Backwash velocity**	US	10 - 12 gpm / ft ²
	SI	25 - 30 m/h
Backwash time**	10 - 15 minutes	
Rinse time**	2 - 3 minutes	

** Note: Stated parameters could be more or less in some cases depending on inlet parameters.

Warning: Do NOT exchange pressure vessel media from one pressure vessel to another. Reason for inadequate sanitation during the exchange of media. Wet media will absorb nitrogen and oxygen in the air which will immediately kick off the bacteria growth. Biofouling on surface of media as other contaminants are present during the exchange. Media is designed only for iron manganese, hydrogen sulfide and other heavy metals. Media containing biofouling cannot be reused as it is harmful for drinking water. Replacing new media is highly suggested.

To know and learn more about this huge potential of **KATALYST-LIGHT** please contact us:



WHAT IS KATALYST LIGHT?

KATALYST LIGHT is a new brand of revolutionary advanced filtration media completely developed in Germany. It's composition simply makes it outstanding against the contemporary filter media available in water treatment industries, like sand, BIRM, Greensand Plus, Manganese Greensand etc. **KATALYST LIGHT** is manufactured in Germany.

KATALYST LIGHT is engineered with unique MnO_2 coating technique on **ZEOSORB®**, providing it light weight, higher filtration surface, more service life and more reliable performance (filtration down to $3 \mu m$) than any other existing granular filter media.

KATALYST LIGHT is being used in numerous system for residential, commercial, industrial and municipal applications worldwide, for High level filtration, color and odor removal, Iron, Manganese, Hydrogen sulfide removal, efficient reduction of Arsenic, Zinc, Copper, Lead, Radium, Uranium and other radionuclides and heavy metals.

KATALYST LIGHT is Certified to NSF/ANSI-61 standard for drinking water applications and has met the ANSI/NSF 372 Lead free compliance.



Advanced use

High concentration coating of MnO_2 on the **KATALYST LIGHT** surface [10%] is the biggest advantage compared to any similar product available in the market. This makes the oxidation and co-precipitation of contaminants much more effective. For removal of very high concentration of contaminant it's recommended to use H_2O_2 as an oxidizer, which provides accelerated catalytic oxidation on the surface of the media. Conventional oxidizing agents like chlorine or potassium permanganate also could be used if required.

KATALYST LIGHT can be used for Arsenic, Radium, Uranium removal but in these cases there is requirement of Iron in the water.

KATALYST LIGHT system is designed with special iron dosing technology which has many advantages over Adsorbent media used for Heavy Metal removal.

The Future

The future of water treatment, as we see it, is going to give us more difficult challenges and we all need more advanced and robust products.

In Watch Water®'s vision, **KATALYST LIGHT** can be addressed for advanced concepts like Water Reuse, Controlled Adsorption of Arsenic and Heavy Metals, advanced Membrane pre-treatment, Zero-Discharge Cooling tower etc.

Contact us for information.

Standard Packaging:
 1 ft³ bags (28 Liters);
 Mass: 30 kg (66 lb)
 40 bags on a Pallet
 16 Pallets in a container



Watch Water® **KATALYST LIGHT** systems offer a new technology with advanced catalytic filtration available in water treatment industry. All systems have been engineered keeping both professionals and consumers in mind. Systems are available with different models and customized for manual back-wash without using electricity or it can be made fully-automatic. System can be used in a variety of applications including residential, commercial and any process water applications for food and beverage industry.

Standard systems are designed with a filtration velocity of 20 m/h [8.2 gpm/ft²] to provide a good filtration. This value may differ for advanced application like Arsenic, Radium, Uranium and other



Advanced Features

of **Katalyst-Light** | Advanced Applications

Fracking

Reducing radionuclide waste in fracking wastewater

Industrial Wastewater:

Reducing radionuclide waste in fracking wastewater

Cooling tower re-circulation

Dramatically reducing the blow-down water and using part of it in re-circulation process

Reverse Osmosis Pre-treatment

Increasing the membrane life-span 3-4 times more

Removal of Arsenic

by the method of co-precipitation

Radionuclide removal

Radium,
Uranium

KATALYST - LIGHT COMPARISON TABLE

	Katalyst-Light®	Greensand Plus	Filter-OX
Certification	WQA Tested and Certified to NSF/ANSI/CAN Standard 61 and 372 Lead Free (Click here)	WQA Tested and Certified to NSF/ANSI/CAN Standard 61	WQA Tested and Certified to NSF/ANSI/CAN Standard 61
Turbidity	Excellent	No	No
Suspended Solids	Excellent	No	No
Iron	Up to 100 mg/l	≥ 15 mg/l	No Data
Manganese	Up to 20 mg/l	No Data	No Data
Arsenic	Depends on Iron Content Fe:As ≥ 20:1	Depends on Iron Content Fe:As ≥ 20:1	No Data
Active Ingredient (MSDS)	Gamma Manganese Dioxide (MnO ₂) ≥ 10% Zeosorb = 85% No Silica (SiO ₂)	Manganese Dioxide (MnO ₂) = 3.2 - 4.8 % Quartz (SiO ₂) = 90.4 - 93.6%	Manganese Dioxide (MnO ₂) = 10 - 20% Quartz (SiO ₂) = 55 - 85%
Surface Area	320 m ² /gram	No Data	No Data
Effective Particle Size	Uniform Size (0.6 - 1.4 mm)	(0.25 - 1.0 mm)	(0.354 - 1.0 mm)
Product Weight	Light (1060 grams/liter)	Heavy (1,425 grams/liter)	Heavy (1,345 grams/liter)
Shipping Weight	66 lbs./ft ³ 30 kg/ft ³ (Light)	89 lbs./ft ³ 40 kg/ft ³ (Heavy)	84 lbs./ft ³ 38 kg/ft ³ (Heavy)
Packaging	1 ft ³ (28 .3 liters) /bag 40 bags (1,132 liters)/pallet	0.5 ft ³ (14 .1 liters) /bag 55 bags (779 liters)/pallet	0.5 ft ³ (14 .1 liters) /bag 48 bags (679 liters)/pallet
Service Flow Rate	4 - 12 gpm/ft ² (10 - 30 m/h)	5 - 12 gpm/ft ² (12.5 - 30 m/h)	2 - 12 gpm/ft ² (5 - 30 m/h)
Backwash Flow Rate	10 - 12 gpm/ft ² @ 55 °F (25 - 30 m/h)	12 gpm/ft ² @ 55 °F (30 m/h)	12 gpm/ft ² @ 55 °F (30 m/h)
Initial Start Up	Backwash approximately 20 minutes or until backwash water is clear as Katalyst-Light is Absolute Dust-Free	Requires minimum 4 hours Cl ₂ regeneration	Cl ₂ sterilization recommended but not required
Regeneration Chemical	No chemicals required	Intermittent or continuous feed using Cl ₂ or O ₂	Intermittent or continuous feed using Cl ₂ or O ₂
Clean Filter Pressure drop @ 5 gpm/ft² / (12.5 m/h)	0.8 psi per foot of bed depth	0.8 psi per foot of bed depth	0.8 psi per foot of bed depth
Commercial System Larger than 36" Tanks	Same as Above No Air/Water Scour Backwash	Air/Water Scour Backwash	Air/Water Scour Backwash
Installation Allowed in California	Yes	No	No
Made in:	Germany	Brazil	Ukraine



AQUAMETRICS ENVIRONMENTAL

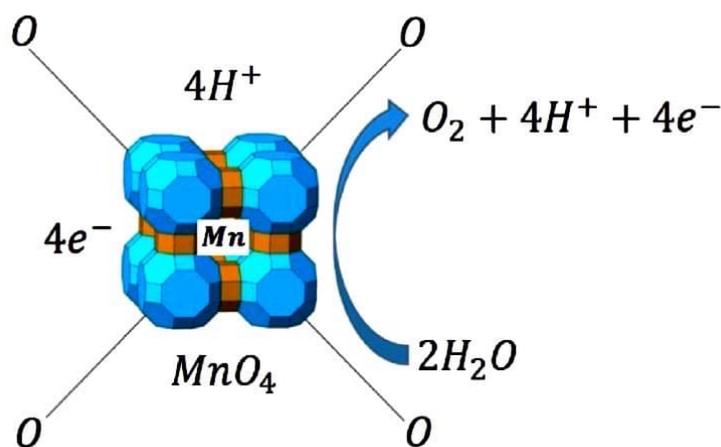
Master Distributor Watch Water® Products

KATALYST - LIGHT

IRON AND MANGANESE REMOVAL FROM GROUND WATER

Watch Water has created a revolutionary catalyst with the highest negative charged surface for **Hydrolysis and for ions' splitting**.

A) Hydrolysis and Water splitting



All hydrogen ion's (H^+) are attracted on the surface of Katalyst-Light media as shown in above figure. One **big secret** to the success of the Katalyst-Light is the **extremely large surface of the Gamma-MnO4**, which is highly negative charged surface media than all previously known manganese based media's.

Subject - pH

- A) Hydrolysis and Water splitting
- B) Precipitation of hydroxides
- C) Precipitation of Carbonates
- D) Oxidation – Reduction reaction
- E) Precipitation of sulfides

Relation among **Redox potential, pH and Ion's content** of water, which is high on hydrogen and bicarbonates.

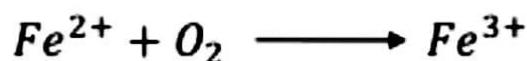
KATALYST
LIGHT™

Sources of Iron, Manganese and pH

Chemistry of Iron in water supplies can exist in either of the following states:

- 1) Divalent ferrous iron Fe^{2+} (soluble)
- 2) Trivalent ferric iron Fe^{3+} (insoluble)

The process of oxidizing divalent ferrous ion (Fe^{2+}) to trivalent ions (Fe^{3+}) can be described by



WHY USE?

KATALYST – LIGHT COST BENEFITS

Katalyst-Light® is the **Best Available Technology (BAT)** as the filter media of the future and has much more to offer.

Filtration Why should you use **Katalox-Light®** instead of any sand products?

- **Better Filtration (3 microns)**, means crystal clear water
- Leading Water treatment system manufacturers recognize this benefits and have chosen to promote this unique Katalox Light media.
- Removal of Hydrogen sulfide – better drinking water comfort – no odor – bad taste – no more irritation to skin and eyes
- Because of its very high surface area, the backwash rate is very less as well as the frequency of backwash – therefore **saving water up to 50%** than conventional products

Weight

How much Katalyst-Light® do you need?

- **Katalyst-Light®** has a higher surface thus lower bulk and true density than medias based on Sand, hence you require 65% by weight of the Sand-based products and this will very depending on the size of the water-treatment systems.

Example: 30 kg (66 lb.) bag of **KL** is equivalent to volume of 28.3 liters (1 ft³) where sand products are 20 kg (44 lb.) in volume for 14.15 liters (½ ft³)

		Volume	Weight
1 bag of Katalyst-Light® (KL)	=	28.3 liters	30 kg (66 lb.)
1 bag of Greensand Plus (GSP)	=	14.15 liters	20 kg (44 lb.)

Example: For requirement of,
1000 liters of filter media you need **35.3 bags** (each 30 kg) of **KL**
 Vs.

1000 liters of filter media you need **70.7 bags** (each 20 kg) of **GSP**

And here's the difference in weight:

1000 liters of GSP = 1413.4 kg (3116 lb.)

1000 liters of KL = 1059.0 kg (2335 lb.)

Difference = 354.4 kg (781 lb.)

-and this is paid for higher transport cost

- Higher the bulk density, higher the weight per volume of the media and higher the transport cost !

Example with a filter design:

All pressure vessels have a standard size, e.g. let's take 24x69 and specify the amount of Filter-media required:

Typical 24x69 Pressure Vessel has a volume of 450 liters

If one wants to design a system with this pressure vessel model according to Greensand Plus's specification with 50% freeboard (225 liters of media fill),

GSP bags needed = 225 liters / 14.15 liters/bag = **16 bags** (exact value 15.9 bags)

KL bags needed = 225 liters / 28.3 liters/bag = **8 bags** (exact value 7.95 bags)

...and 80 kg (176.37 lb.) extra weight for transportation for GSP

Why Katalyst-Light® has better performance?

Contact time Why and how you can have high contact time in Pressure Vessel?

Tests carried out by all universities in the world has proved that **Media Filters** designed with higher depth and with less freeboard can filter out contaminants down to less than 2 to 3 microns.

This compares with,

50% freeboard with sand media providing 50 micron filtration

Vs

40% freeboard with Katalyst-Light® filters providing 2-3 micron filtration

Katalyst-Light® removes heavy metals and potentially harmful silica compounds.

Katalyst-Light® is **Made in Germany** like Mercedes, Porsche, BMW or Audi – with strict quality control and it is WQA certified to meet NSF/ANSI 61 standard.

PHOSPHATES ADDED WATER WITH KATALYST LIGHT

Why Phosphates are not good in water treatment?

Phosphates are the chelates and it is the family of the chemicals which can bound the minerals/metals and keep them in the solution. When phosphate compounds are added to the water with dissolved iron; it bound/surround the iron. This bounded/surrounded iron is known as sequestered iron. This sequestered iron cannot react with the oxygen and precipitate itself.

Following are the main reason for not using phosphates in water treatment.

1. Not effective at higher concentration of metals.
2. Releases sequestered metals at high temperature.
3. Releases sequestered metals at low pH.
4. Less effective with time. They revert themselves from poly to ortho phosphates.
5. Increase bacterial growth in plumbing system.
6. Increase weed and algae growth dramatically in water body such as lakes, rivers etc.
7. Nonworking for already turned rusty Iron, Manganese and other metals.
8. Not commonly use in drinking water.
9. Makes the water taste metallic.
10. Makes the water slippery.



Effects

Instability of the phosphate compounds in acidic solution will result in the breakdown of the phosphates and releases the minerals/ metals such as iron, manganese, calcium, and etc (all the minerals/metals it has surrounded before). This is the case when the titration test is performed for the detection of the iron in the water. In result, titration acid will break down the phosphates and releases the iron back into the water.

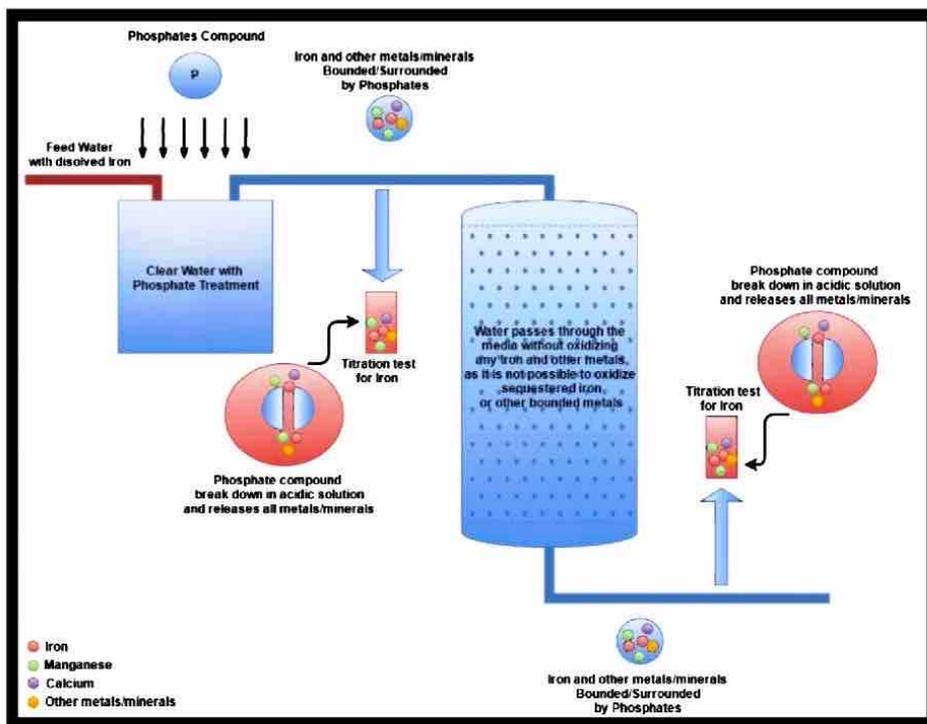
Adding of phosphate compound is not recommended prior to any oxidation based iron removal technology. When phosphate added water is passed through the media, it will pass through the media without any precipitation. Because it is not possible to oxidize the surrounded iron. Therefore, as explained above the titration test after the oxidation based iron removal treatment (permeate water) will result in detection of iron and other minerals.

Note: This is the same case if you perform the titration test before the treatment (feed water).

Solution

The only solution to work filter media properly and to avoid the leakages of subjected concentration, is to remove phosphates prior to the Katalyst-Light or any other technology in the same category. Watch Water products FERROLOX and Catalytic Carbon is one of the best product to remove phosphates from the water.

To know and learn more about this huge potential of **KATALYST - LIGHT**® please contact us:



KATALYST - LIGHT and High pH

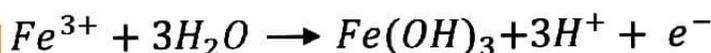
Ferrous iron + oxygen = ferric form
oxidation of ferrous iron into ferric iron
under influence of oxygen $Fe = Fe$
 $+ e$ but trivalent ferric ion need
hydroxyl group to precipitate in solid
form and the whole sequence of
oxidation.



B) Precipitation of Hydroxide



Reduction reaction can be written as



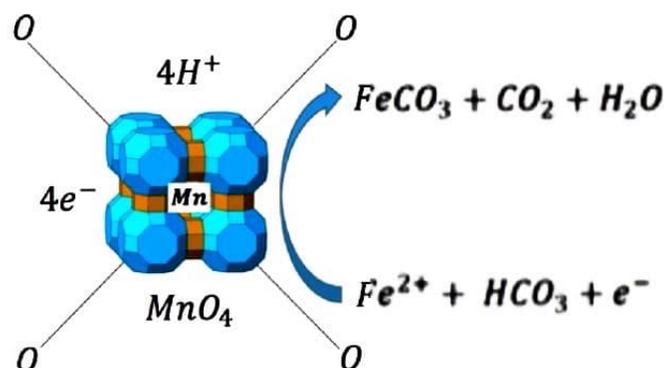
Important to know

The stability of iron depends;

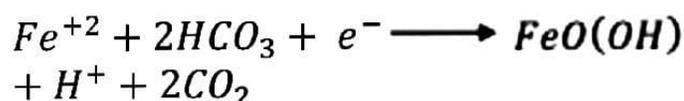
- I. Only on pH of water: (8-8.5)
- II. Activity of electrons which is represented by a redox potential pE.
- III. High positive value of pH indicates oxidizing conditions where iron is insoluble at low pH and value (7-7.5) indicates reducing conditions where iron is soluble.

C) Precipitation of Carbonates

Most of the iron found in ground water is in the form of bicarbonate by the process of weathering. Iron carbonate reacts with CO_2 and get Fe into the solution.



The soils can have iron content of 1% - 10% depends upon the rocks from where soil was derived. Important Iron minerals are iron carbonate = $FeCO_3$ if the H^+ donors are attracted on the negative surface of Katalyst-Light then CO_2 gas escapes and the pH increases as follows



and iron precipitates. Releases carbon dioxide (CO_2) from the ground water. When this happens, the pH values are increased and hence the Fe^{2+} and Mn^{+2} are changed into the insoluble Fe^{3+} and Mn^{4+} minerals, which are in the form of either

- i. Hydroxide or
- ii. Carbonates

The most dominant form of dissolved iron is the soluble Fe^{2+} under the pH of 5 to 8.

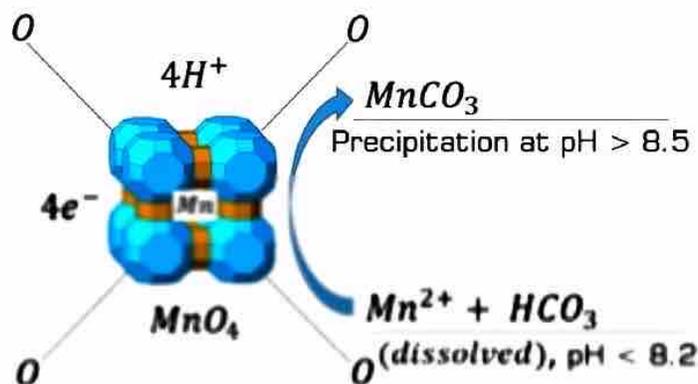
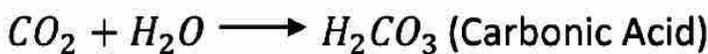


KATALYST - LIGHT and High pH

Chemistry of Manganese

"The two elements Iron and Manganese are often considered together, particularly in the technology of water treatment, because they cause similar problems and any technology should remove both. (BIRM) is bad at removing Manganese. The reason are because Manganese chemistry is different from that of Iron in several important aspects. Manganese is much more difficult to remove from water than Iron. Most of the iron and manganese filter media's fail to remove both at the same time. "

In ground water, Manganese exists in two forms. If bicarbonate species are present in the system and such species are present in practically all natural water because of the widespread availability of carbon dioxide in water:

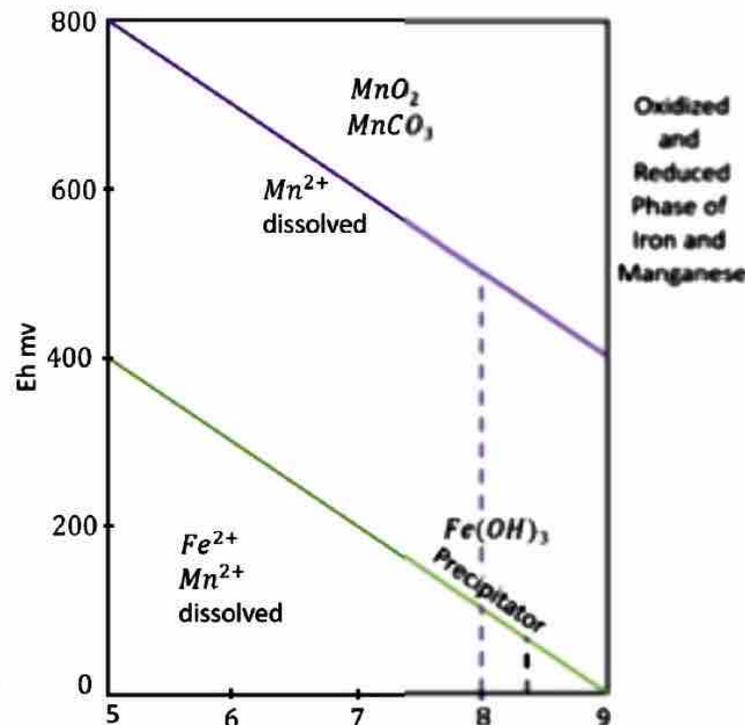


Iron and Manganese Precipitation

"Function of pH and Eh"

The presence of constant total activity of bicarbonate species equivalent to

100 mg in HCO_3^- . Figure 2 represents any water with contact with air or from other sources that could supplement the amount of carbon dioxide will dissolve Manganese in Surface water or Ground Water. The pH at which Mn^{2+} activity is 1.8×10^{-7} molar is than at computed be 9.0 as shown in Picture 1.



Picture 1

As the activity of bicarbonate decreases with increasing pH above 8.2, the $MnCO_3$ boundary curves. So any changes of pH in a treated water system containing bicarbonate and changing into carbonate solids will alter the amount of dissolved bicarbonate so that pH shift's can be huge.

The solid of Manganese carbonate is freshly precipitated varies the CO_2 escapes and the pH is increased.



KATALYST - LIGHT and High pH

Also, the equilibrium equation for water of precipitated applies.

$$\frac{[Mn^{2+}][HCO_3^-]}{[H^+]} = 1$$

And the ionic product of treated water is involved.

$$[H^+][OH] = 10^{-14}$$

Manganese involving sulfate

"Manganese sulfate"

Watch Water has made the iron and manganese removal so simplified by coating Gamma Manganese dioxide on very high surface of Zeosorb, where $[Mn^{2+}] = 1.8 \times 10^{-7}$. This is in the pH range, where the concentration of CO_3^{2-} and OH^- can be neglected.

$$[HCO_3^-] = \frac{4.7 \times 10^{-7} \times [H_2CO_3]}{[H^+]} = \frac{6.0 \times 10^{-12}}{[H^+]}$$

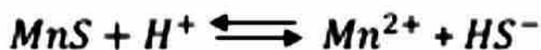
$$[HCO_3^-] = \frac{[H^+]}{[Mn^{2+}]} = \frac{[H^+]}{1.8 \times 10^{-7}}$$

$$\text{Hence, } \frac{[H^+]}{1.8 \times 10^{-7}} = \frac{6.0 \times 10^{-12}}{[H^+]}$$

$$[H^+]^2 = 1.08 \times 10^{-14}$$

$$[H^+] = 1.04 \times 10^{-9}, \text{ pH} = 9.0$$

Manganese sulfate is a readily soluble compound as the CO_2 enters the ground water and the pH decreases. MnS (Manganese Sulfide) is dissolved to yield Mn^{2+} as in the equilibrium.

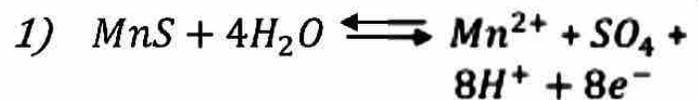
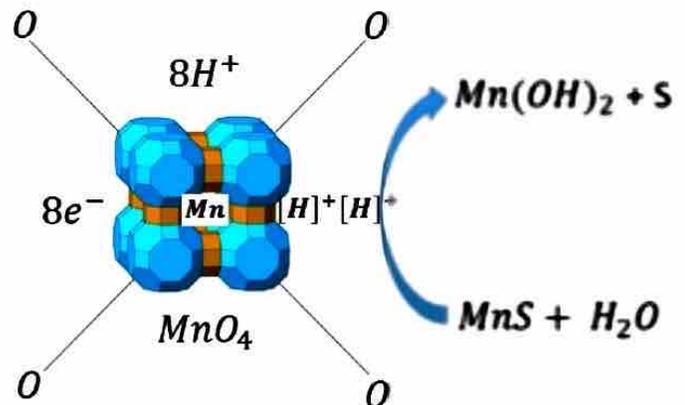


or in equilibrium

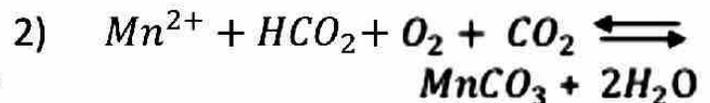


At a high pH, the MnS boundary is affected. Hence, when the pH value is greater than about 10.5 or 11 and when the activity of the sulfur species

is 1000 mg, the MnS field is replaced by the $Mn(OH)_2$ and sulfur as gas leave the water. So pH over 10 in water analysis of Manganese Sulfide is very important. And the simplest explanation of the results seems to be that two-step reaction occurred in which Manganese sulfide was converted to Carbonate.



And air released in the system aeration by value or externally contained some (0.4)% carbon dioxide, as it dissolved, precipitate manganese as the carbonate.



And the pH increased consuming CO_2 and changing the equilibrium

Thus Manganese sulfide dissolved and manganese carbonate precipitate. The dissolved manganese in ground water is always present where certain Anions common in natural water are located.



Is given as 3.0×10^3 . And without the buffering capacity this will upset the pH in water.

KATALYST - LIGHT and High pH

The activity of bicarbonate as shown.

$$\frac{MnHCO_3^+}{[Mn^{2+}]} = 3.0 \times 10^{-3} \times 6.0 \times 10^3 = 9$$

Thus because of no Gas phase is present in treated water raises:

pH = No CO₂ = Carbon Dioxide
= No H = HCO₃ = Bicarbonates
= No sulfur = MnS

Keeps a constant pH of 8-10 depends on buffering capacity of water. The loss of bicarbonate and increase in pH is related in part to equilibrium of the dissolved CO₂ with a portion of previously dissolved CO₂ in Iron, Manganese and SO₄ (sulfate) that has now migrated to the gas phase.



The energy of the Katalyst-Light is very aggressive in the startup of the system and calms down with a continuous backwash of system for 1 to 2 hour's. When a stable pH of 8 to 10 is reached, it retains enough buffering capacity. pH should be all the time over 9.99 to stop HCO₃ complexing.

5

KATALYST-LIGHT

To know and learn more about this huge potential of **Katalyst-Light** please contact us: