

# KATALOX-LIGHT®

## THE CHEMISTRY OF IRON REMOVAL



Gamma  
surface



pH  
response



Oxidation



Precipitation



Filtration

**DISSOLVED IRON BECOMES A SOLID.  
KATALOX-LIGHT CAPTURES IT.  
BACKWASHING REMOVES IT**

### 01 IRON ENTERS IN DISSOLVED FORM

Groundwater can contain dissolved ferrous iron,  $\text{Fe}^{2+}$ . Water may look clear even when this iron is present. Dissolved ions pass through ordinary particulates, so the treatment must first convert them into a form that can be captured.

The chemistry depends on pH, oxygen or another suitable oxidant, alkalinity and contact time.



### 02 THE SURFACE CAN BIND HYDROGEN IONS

Negatively charged surface oxygen sites can take up  $\text{H}^+$ :



Net  $\text{H}^+$  uptake can lower hydrogen-ion activity in the water and raise pH.  $\text{H}^+$  means a hydrogen ion, not a hydrogen gas molecule. More  $\text{H}^+$  captured at the surface can mean less  $\text{H}^+$  activity in the water.



### 03 OXIDATION CHANGES $\text{Fe}^{2+}$ TO $\text{Fe}^{3+}$

Dissolved ferrous iron must lose an electron to become ferric iron:



This is an oxidation half-reaction. Oxygen or another suitable oxidant accepts electrons in the complete reaction. The active manganese-oxide surface supports catalytic treatment. Raising pH supports iron treatment, but raising pH alone is not the same as oxidizing  $\text{Fe}^{2+}$  to  $\text{Fe}^{3+}$ .



### 04 FERRIC IRON FORMS HYDROXIDE SOLIDS

At suitable pH, ferric iron reacts to form poorly soluble ferric hydroxide:



An equivalent hydrolysis expression is:

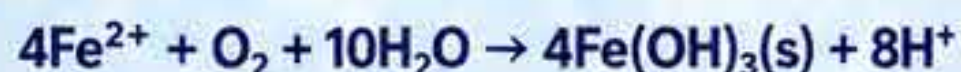


$\text{Fe}(\text{OH})_3$  is a simplified representation of hydrated ferric oxide and oxyhydroxide precipitates. These are the familiar yellow-brown or rust-coloured solids that the filter can retain.



### 05 ALKALINITY SUPPORTS THE PROCESS

A simplified overall reaction using dissolved oxygen is:



Iron oxidation followed by precipitation releases acidity. The water's alkalinity and reactive media components help determine the resulting pH. This is why inlet pH alone cannot predict the outlet pH. The process must balance iron loading, oxidant availability, acid production and buffering.



### 06 FILTRATION AND BACKWASH COMPLETE REMOVAL

The Katalox-Light bed captures the newly formed iron solids. Surface adsorption can also contribute to iron retention. Appropriate bed depth and contact time allow the treatment reactions and capture to occur.

Backwashing expands the media bed and carries accumulated iron solids into the backwash stream. Iron is separated from the treated water; it is not destroyed.



### WHY THE SURFACE MATTERS

- ✓ Accessible reactive sites support water-media interactions.
- ✓ Proton uptake is finite: a site becomes less negative when it binds  $\text{H}^+$ .
- ✓ The sustained pH response depends on the complete chemistry.
- ✓ Published product data also list hydrated lime, so surface and binder contributions must be distinguished by measurement.



### FROM WATER CHEMISTRY TO CLEARER WATER

- ✓ Optimize pH and oxidation.
- ✓ Form iron solids.
- ✓ Capture the solids.
- ✓ Backwash.
- ✓ Verify dissolved and total iron, outlet pH and turbidity.
- ✓ Select operating conditions for the actual water and treatment target.



GERMAN WATER TECHNOLOGY - SURFACE CHEMISTRY. PRECIPITATION. SEPARATION.

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