

ECHA-Workshop

Implications of use of trivalent chromium in functional plating with decorative character

10/10/2022



VDMA

Who we are

VDMA

- » Leading federation of European mechanical engineering
- » 36 trade associations

VDMA Valves

- » Valves manufacturers associations
 - Sanitary tapware I building valves
 - Industrial valves
 - 170 member companies



VDMA Who we are

Sanitary tapware

- » Functional plating with decorative character as main topic for the industry
- » Companies with own electroplating or with suppliers | service providers
- » Hexavalent Chromium = used and approved since decades
- » Challenge: switching processes to trivalent Chromium
- » One aspect: Borates | water treatment

Chromium(III) Electrolytes

Main substance are used for commercial electrolytes in Trivalent Chromium for functional plating with decorative character

- » 1. Chromium(III)-Sulfate as metal supplier
- » 2. Alkali-Sulfates for conductivity
- » 3. **Buffers stabilizes chemical reduction**

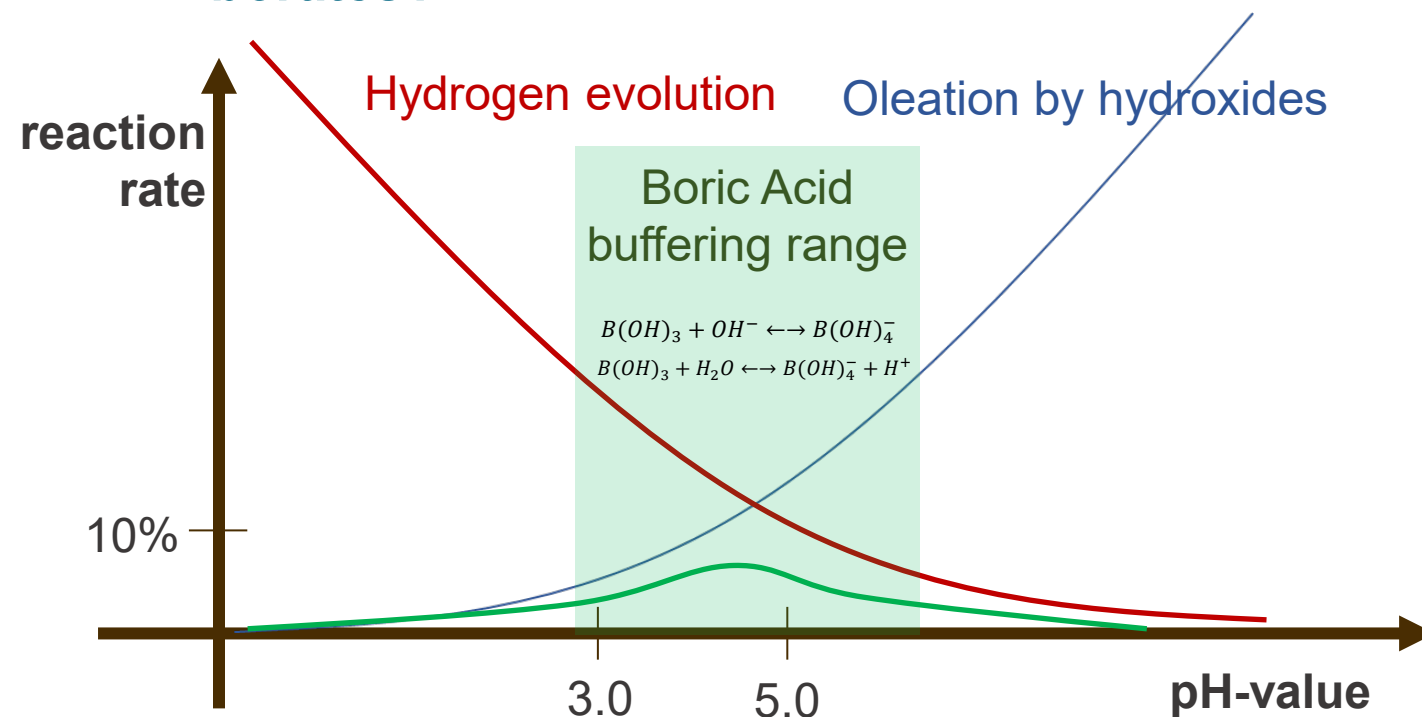
Boric acid (10043-35-3), but no disodium tetraborate (1330-43-4)

- » 4. Organic acids supporting chemical reduction
- » 5. Tensides optimizing chemical reduction



Chromium(III) Electrolytes

pH buffer for electro crystallization – why borates?



Chromium reduction is highly limited by pH-depending side reaction in aqueous electrolytes. Only the unique pH-compensating properties of Boric Acid allows Chrome reduction for practical application.



Borates in Production

Approx. amount* of Borates for Trivalent Chromium in functional plating with decorative character in a middle-sized electroplating line of 100,000 square meter output

Annual addition
Boric Acid
8 ... 12 t

Actual Boric Acid
in plating bath
0.5 ... 1.0 t

Annual trag out
Boric Acid
8 ... 12 t

* Based on average concentration of 90 g/L

MII Measures MIIII

Use of borates for Trivalent Chromium in functional plating with decorative character

- » 1. Exhaust and ventilation for aerosols with air purification
- » 2. Rinsing of plated parts
- » 3. Separated working spaces
- » 4. Regularly measurements of air quality
- » 5. protective equipment for workers and safety instructions
- » **6. Closed wastewater cleaning**

There is no feasible technique to remove borates from wastewater

Costs for evaporation and landfilling would tremendous



Wastewater Treatment in Relation to Borates

Detailed facts of Borate

- » Borate are contained in Nickel- and trivalent Chromium-electrolytes by 30 and 90 g/L
- » Borate are not measured throughout the whole plating process
- » There are no limits for Borate or Boron in wastewater (only for drinking water 1 mg/L)
- » Borates couldn't be removed from wastewater because of Salts beside
- » Borates could only be reduced by strong ion exchanger in highly diluted solution like drinking water

Wastewater Treatment Cr(VI)- vs. Cr(III)-electrolytes

conventional fluent treat

Detoxification

Precipitation

tri-Chrome fluent treat

1. ^{hard} complexed
2. ^{low} complexed
3. ^{weak} complexed

UV oxidation
(\$)

chemical
oxidation

Precipitation

⚡ Intermediate
hex Chrome

⚡ Intermediate
hex Chrome

Detoxification

Detoxification

Precipitation

Precipitation

All versions of trivalent Chrome are on the market – changing electrolytes have a huge impact on wastewater treatment



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A vertical image on the left side of the slide. The top part shows a person's legs in blue jeans and a dark jacket, standing next to a silver suitcase handle. The bottom part shows a person's legs in blue jeans and brown shoes, standing next to a brown suitcase with a leather strap and a wheel. The background is a blurred outdoor setting, possibly a train station.

Your contacts

Thank you
Thank you
for your attention!