

Cleaning of Hydrochloric Acid Pickling Baths

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Purolite®



Puro-lite®

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Responding to our customers' needs, Puro-lite has the widest variety of products and the industry's largest technical sales force. Globally, we have five strategically located research and development centers and eight application laboratories. Our ISO 9001 certified manufacturing facilities in the United States of America, United Kingdom, Romania and China combined with more than 40 sales offices in 30 countries ensure complete worldwide coverage.



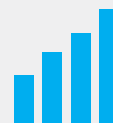
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We are technical experts and problem solvers. Reliable and well trained, we understand the urgency required to keep businesses operating smoothly. Puro-lite employs the largest technical sales team in the industry.



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Cleaning of Hydrochloric Acid Pickling Baths

Hydrochloric acid is commonly used in pickling bath applications for cleaning of metal surfaces. In the pickling process, the acid becomes more and more concentrated with metals, which have been dissolved from the treated metal surfaces. When the efficiency of the pickling acid becomes too low it must be replaced by fresh acid.

Recycling of the spent acid after removing the metallic ions is common practice to minimize operating costs.

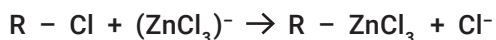
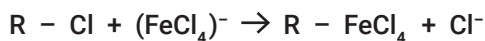
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Metals Removal By Ion Exchange

Dissolved metals form chloride complexes in hydrochloric acid that can be removed by using strong base type anion exchangers, such as Puromet™ MTA5000 or MTA5500. These anionic complexes are only stable in concentrated hydrochloric acid. Increasing the pH leads to hydrolysis. Therefore, regeneration can simply be carried out with water. To avoid neutralization of the hydrochloric acid, Puromet MTA5000 and MTA5500 are supplied and used in the chloride form.

Metals Removal From Concentrated Hydrochloric Acid



Regeneration with Water



Operating Capacity

As the anionic metal complexes stability is very much dependent on HCl concentration and strong base type anion resins can only fix the metals when present as anionic complex, it follows that the operating capacity is a function of the acid concentration. The curves in Figure 1 illustrate the operating capacity of Puromet MTA5500 for the removal of Fe(III) as a function of the acid strength. The resins can be run in single column systems or in series of two or more columns.

In the first case the resin will be run to a leakage endpoint. In the second case the lead column will be run to saturation and the trail column to a leakage endpoint. Curve 1 shows the operating capacity to saturation, Curve 2 the operating capacity to leakage endpoint.

FIGURE 1

**Operating Capacity
of Puromet MTA5500 for
Fe³⁺ Removal from HCl**

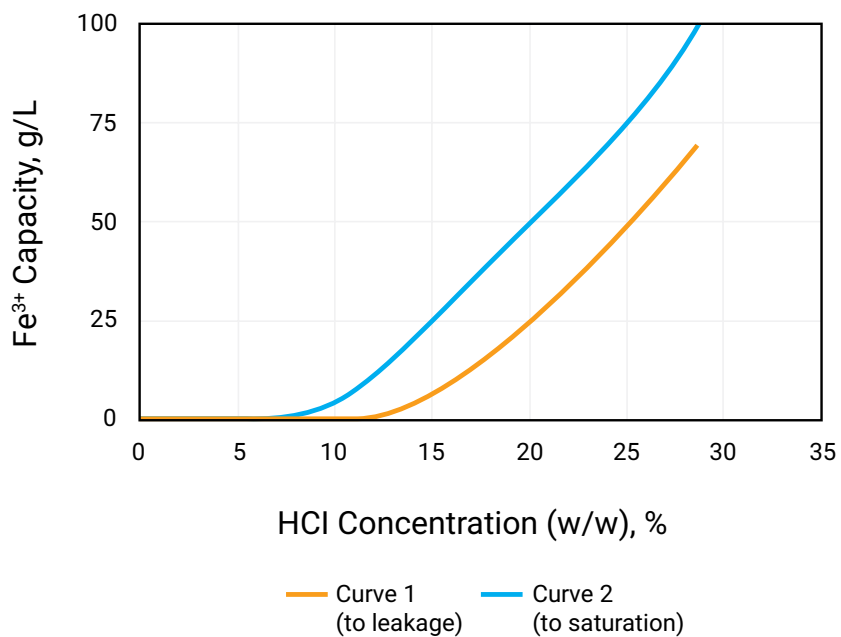


Figure 1 also shows that purification by anion exchange resins will be only economic from a minimum acid concentration. The minimum acid concentration depends on the stability of the anionic complex and is therefore different for different metals. Table 1 gives a rough guideline at which concentrations ion exchange treatment should be considered.

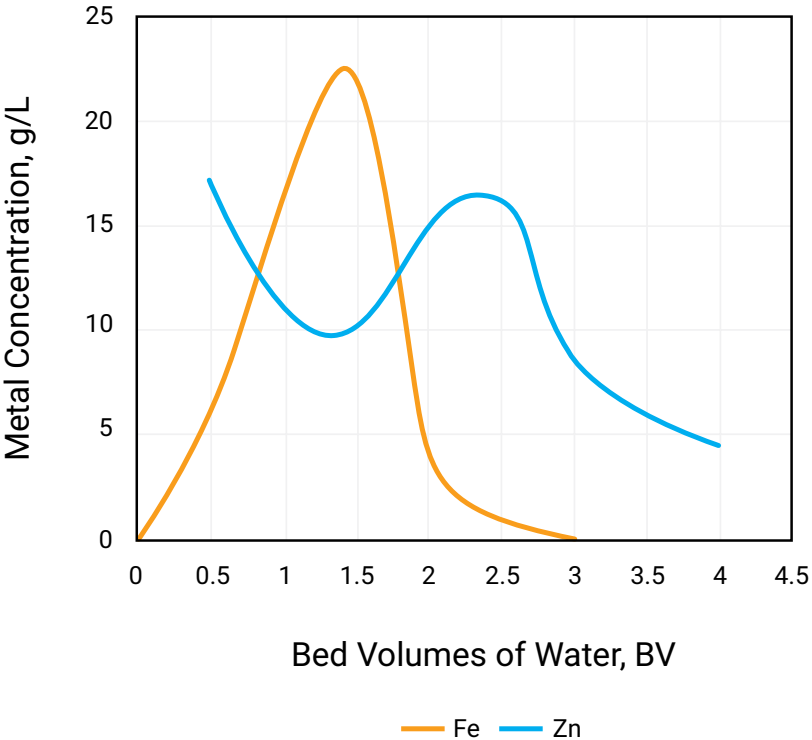
TABLE 1 Recommended Minimum HCl Concentrations

Metal	Hydrochloric Acid Concentration, % w/w
Iron (Trivalent)	> 17
Iron (Divalent)	> 25
Zinc	> 7
Copper	> 15

Regeneration

As already explained, the regeneration is carried out by eluting the metal complexes with water. Figure 2 shows a typical elution profile of an application where iron and zinc were removed from the pickling acid.

FIGURE 2
Typical Elution Profile





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Algeria
Australia
Bahrain
Brazil
Canada
China
Czech Republic
France
Germany

India
Indonesia
Israel
Italy
Japan
Jordan
Kazakhstan
Korea
Malaysia

Mexico
Morocco
New Zealand
Poland
Romania
Russia
Singapore
Slovak Republic
South Africa

Spain
Taiwan
Tunisia
Turkey
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Ukraine
USA
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Americas

Purolite Corporation
2201 Renaissance Blvd.
King of Prussia, PA 19406
T +1 800 343 1500
T +1 610 668 9090
F +1 800 260 1065
americas@purolite.com

EMEA

Purolite Ltd.
Unit D
Llantrisant Business Park
Llantrisant, Wales, UK
CF72 8LF
T +44 1443 229334
F +44 1443 227073
emea@purolite.com

FSU

Purolite Ltd.
Office 6-1
36 Lyusinovskaya Str.
Moscow, Russia
115093
T +7 495 363 5056
F +7 495 564 8121
fsu@purolite.com

Asia Pacific

Purolite China Co. Ltd.
Room 707, C Section
Huanglong Century Plaza
No.3 Hangda Road
Hangzhou, Zhejiang, China 310007
T +86 571 876 31382
F +86 571 876 31385
asiapacific@purolite.com

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We're ready to solve your process challenges. For further information on Purolite products and services, visit www.purolite.com or contact your nearest Technical Sales Office.



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