XUS 43578.00

Uniform particle size, chelating resin for copper, nickel, and cobalt processing

Product	Type	Matrix	Functional Group
XUS 43578.00	Chelating Resin	Styrene-DVB, macroporous	Bis-Picolylamine

Specification and typical properties

Item	Specification Limit	Typical Property Range
Copper loading (pH 2, 6 gram/L feed)	Min. 35 grams per liter	35-42 grams/L
Functionality		Multi-dentate amine ligand
Particle size		410 μm, uniform particle
Form		Weak base/partial H_2SO_4 salt
Physical appearance		Opaque bead
Color		Tan to dark brown to dark green
Bulk density (as shipped)		42 lbs/ft^3
Moisture		40-60%
Shelf life		8-10 years

General

XUS 43578.00 chelating resin is unique in the chemical processing world. No other commercially available resin product is capable of selectively capturing transition metal ions from solutions with pH less than 2, or in the presence of homogeneous chelating agents such as EDTA. The chemistry of XUS 43578.00 is based upon a special chelating amine ligand which is partially quaternized by sulfuric acid as received. When in this conjugate sulfuric acid salt form, the resin is fully swollen and hydrated, and ready for scavenging metals from acidic media.

Most metal scavenging jobs can be handled easily with standard iminodiacetic acid or aminophosphonic type chelating resins; however, the tough jobs require the extra chelating power of XUS 43578.00 chelating resin:

- If you need to remove copper or nickel from very strong acid (pH<2) solutions, such as those common in plating electrolyte or in microelectronic etching solutions.
- If you need to remove chelated copper or nickel from solution.
- If you need to strip copper or nickel from strong brine solutions XUS 43578.00 chelating resin may be your answer.

Commercial Applications

Two commercial applications which have found the unique properties of XUS 43578.00 chelating resin to be indispensable for their low cost metal processing needs:

1. Cobalt Electrolyte Purification (Cobalt/Nickel Separation)[1-6]

Two of the world's major cobalt producers are operating world-class low cost cobalt electrolyte purification processes employing XUS 43578.00 chelating resin to scavenge nickel from cobalt electrolyte.

Table 1 shows the relative loading values of various metals for XUS 43578.00 chelating resin. The resin exhibits an extremely strong affinity for copper, even at low pH, whereas other metals have higher loading values at higher pH. Complexed metals can be removed with strong acid (10N H_2SO_4) or ammonium hydroxide. Sometimes selective elution can be accomplished using varying strengths of acid.

Table 1. Conditional absorption constants (K) for the XUS 43578.00 chelating resin

Metal	pH	K (1/mol)
Cu(II)	2.0	1280
Ni	2.0	375
U(V1)	2.0	190
Fe(III)	2.0	181
Zn	2.0	82
	2.7	184
Co(II)	2.0	51
	3.2	280
Cd	2.0	43
	2.8	196
Fe(II)	2.3	23

Rosato et. al.[4] describe a process for the selective removal of nickel from acidic cobalt sulphate using the XUS 43578.00 (small bead version of XFS-4195.02) chelating resin. A variety of conditions were examined such as temperature, flow rate, feed concentration and acid strength for elution. Feeds of 15-30 g/l cobalt and 0.3-0.7 g/l nickel at pH 2.5 were treated. At pH 2.5 the resin has a high affinity for cobalt and nickel. The cobalt was rapidly absorbed, but with continued flow the nickel displaced the cobalt since nickel is more strongly held than cobalt. Flow rate was found to be important since the nickel/cobalt exchange was slow. A cobalt-rich effluent was obtained with a gradual increase in nickel concentration. Elution of loaded resin was accomplished with sulfuric acid at several strengths, taking advantage of the difference in nickel cobalt binding. Using a split elution technique, the cobalt-rich fractions were isolated to obtain a low nickel-content product. In a mini-plant operation with multiple columns and split elution, solutions containing cobalt-to-nickel ratios > 500:1 were repeatedly obtained.

Jeffers[2] describes a process for recovering cobalt from copper-recycling leach solutions using the XUS 43578.00 chelating resin. At pH 3.0 the resin is loaded with several metals: cobalt, copper, nickel, iron and zinc. However, using 50 g/l sulfuric acid, all but copper is eluted from the resin, which can then be removed with 2N ammonium hydroxide.

2. Trivalent Chromium Plating Bath Purification[11]

Dozens of the world's trivalent chromium platers are pocketing the benefits of using XUS 43578.00 chelating resin. Strap-on type systems utilize XUS 43578.00 chelating resin to capture copper and nickel from the trivalent chromium plating bath solution, eliminating the need for costly periodic shutdown and flushing.

Elution is accomplished with 2N ammonium hydroxide. Recycle of the eluant can minimize waste generation and can result in ammonia/copper waste streams having very high copper content (in excess of 100g/L). Recycle eluant is employed for the initial elution (1-3 bed volumes) followed by fresh 2N ammonium hydroxide solution (1/2 to 1 bed volumes). The resin is then rinsed briefly with water and regenerated to the sulfate form with dilute H_2SO_4 before placing back into service. Please be aware that the resin swells up to 20% when re-acidified.

Literature Survey. XUS 43578.00 (XFS-4195.02, DOW N3, DOWEX* M4195) Chelating Resin

Cobalt/Nickel Separation

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Trivalent Chromium Electroplating Bath Purification

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Ion Exchange Resins and Adsorbents
For more information about ion exchange and adsorbent resins, call the Dow Liquid Separations business:

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Warning: Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.

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