CASE STUDY

Puromet™ MTS9510PF

This document looks at comparison performance data for Puromet™ MTS9510PF and a competitive alternate for the removal of antimony and bismuth from a copper electrolyte solution.

Purolite®

Background

A customer used Purolite® S950 aminophosphonic type chelating resins to remove Antimony (Sb) and Bismuth (Bi) from a copper electrolyte solution for more than 10 years. In their process, some of the electrolyte is treated to remove Sb and Bi and then recycled back to the electrolyte in order to keep the Sb and Bi levels in the electrolyte under control.

Table 1 – Typical copper electrolyte composition

	UNIT	COPPER ELECTROLYTE (FEED)	TARGETS (MEASURED IN COPPER ELECTROLYTE)
Temperature	°C	65 – 70	—
H_2SO_4	%	18	—
Cu	g/L	48	—
Sb	g/L	0.3	< 0.3
Bi	g/L	0.1	< 0.1
Cl	g/L	0.06	No increase
Ni	g/L	18	—
Fe	g/L	0.5	—

They were advised to replace Purolite S950 with a competitive product that claimed to show better Sb/Bi capacity than Purolite S950. However, an additional requirement for the resin in this application is low Cl leakage after HCl regeneration as Cl is disadvantageous in the copper electrolyte.

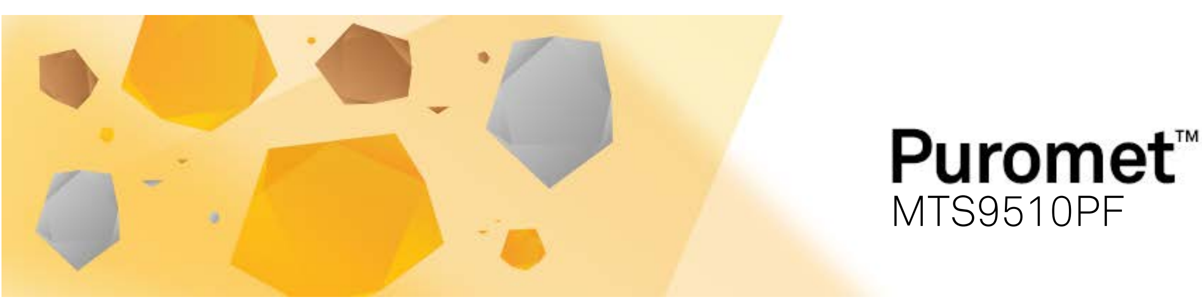
In response, Purolite developed Puromet MTS9510PF with the goal to produce a resin that outperforms conventional aminophosphonic resins on Cl leakage—while showing good operating capacity. Laboratory tests demonstrated that Puromet MTS9510PF showed significantly lower Cl leakage when putting the resin back into service into 18% H_2SO_4 after regeneration with HCl.

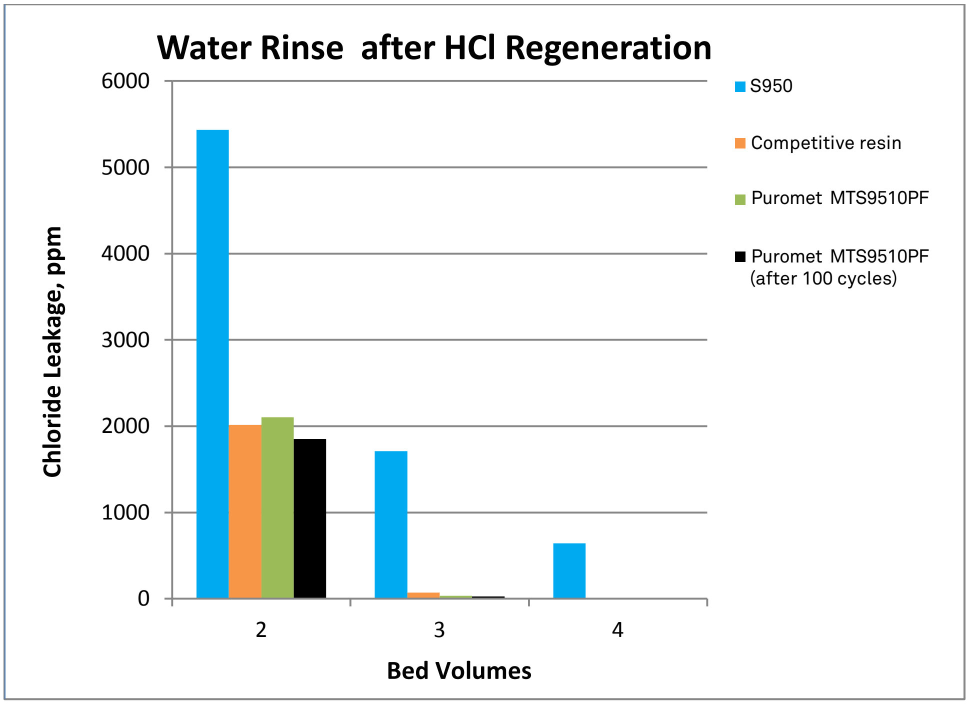
Rinse test data (laboratory data)

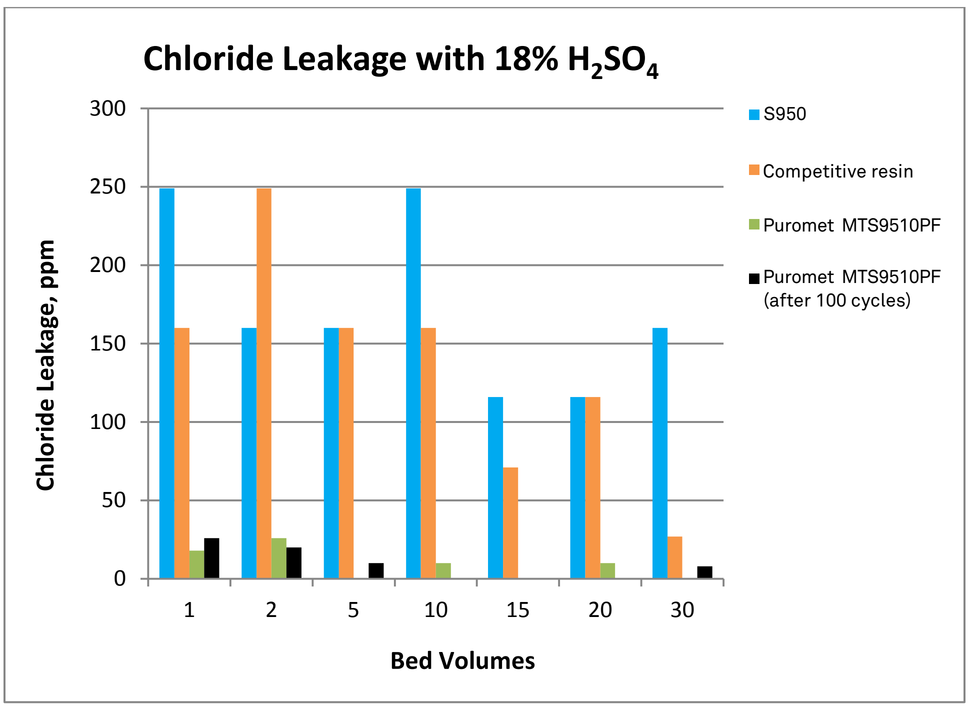
After regenerating under the conditions as shown on the next page, Puromet MTS9510PF showed significantly lower Cl leakage in 18% H_2SO_4. Note, the regenerating condition in below is based on the actual operation at the customer.

- HCl regeneration: 6N HCl (22%), 6 BV = 4 hr dosage at SV = 1.5 BV/hr
- Rinse: DI water, 4 BV = 2 hr dosage at SV = 2.0 BV/hr
- H_2SO_4 loading: H_2SO_4 (18%), 30 BV = 3 hr loading at SV = 10 BV/hr

Additionally, a sample of Puromet MTS9510PF was cycled 100 times with 15% w/v NaOH and 15% w/v H_2SO_4. The rinse test was repeated on the cycled sample, and showed same results as the fresh resin. This confirms the stability of the resin rinse properties with increased service life time.







NOTE: “after 100cycles” in the graph means the sample resin after an acceleration test.

Antimony /Bismuth adsorption capacity test (laboratory data)

Test condition

Batch test conducted by the customer with condition below

- Resin volume 5 mL into 300mL of $CuSO_4$ solution, stirring 18 hours for adsorption.
- Desorption: 6N HCl

Results

Table 2 – Capacity test average of several cycles

		Sb (g/L)	Bi (g/L)
Concentration in feed solution		0.34	0.12
Adsorption capacity (g/L)	Competitive resin	9.8	2.7
	Puromet MTS9510PF	11	3.3

Puromet MTS9510PF showed a 12% higher capacity for Sb and a 22% higher capacity for Bi compared to the competitive resin.

Based on the laboratory data the customer did a plant trial with Puromet MTS9510PF. The excellent results seen in the laboratory were confirmed and were even exceeded in the real plant operation. The customer has in the meantime converted several vessels to Puromet MTS9510PF and is in the process to replace all of the competitive product with Puromet MTS9510PF.

NOTES:

Americas
150 Monument Road
Bala Cynwyd, PA
19004
T +1 800.343.1500
T +1 610.668.9090
F +1 484.384.2751
Americas@purolite.com

Europe
Llantrisant Business Park
Llantrisant
Wales, UK
CF72 8LF
T +44 1443 229334
F +44 1443 227073
Europe@purolite.com

Asia Pacific
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

Purolite®

Algeria
Australia
Bahrain
Brazil
Canada
China
Czech Republic
France
Germany
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