



Polymers for selective
METAL CAPTURE

for precious metal
REFINING AND MINING

POLYMER BEADS FOR SELECTIVE METAL CAPTURE

Magpie Polymers provides an innovative and patented filtration technology for the selective removal of transition metals from industrial waste and process water. By selectively recovering the metal content, our clients obtain a net economic advantage.



TARGET METALS

- **Palladium**
- **Platinum**
- **Rhodium**
- **Ruthenium**
- **Gold**

MAGPIE'S ADVANTAGES: the MPX-series

MPX-series

The MPX series consists of five resins with extreme selectivity for PGMs and gold:

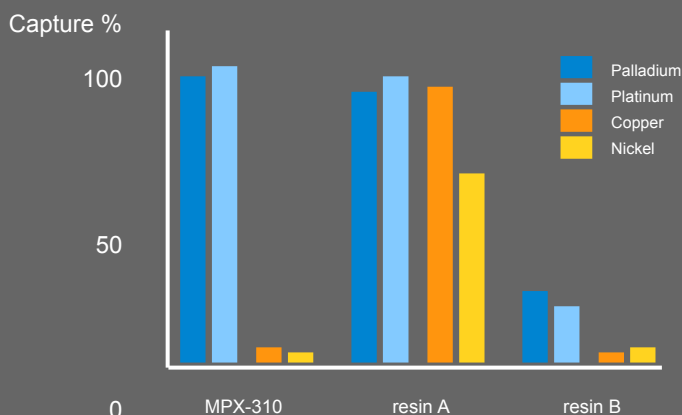
- MPX-310, MPX-316: very low affinity towards common metals and silver, resistant to oxidation.
- MPX-315, MPX-317: not disturbed by presence of organics
- MPX-318: increased rhodium affinity, high loading capacity (19% mass)

The Selectivity Advantage

With better selectivity than any other filtration medium, Magpie's MPX-series resins recover PGM and gold in the presence of high amounts of other metals, organics, salinity or hard water.

The MPX materials are characterized by strong affinity for PGM metals as illustrated in the following order and graph below:

Pt, Pd ≥ Ru, Au, Rh, Ir >> Cu, Ag, Ni, Fe, Pb, Sn, Zn, Al >>> Na, K, Mg, Ca



The Harsh Conditions Advantage

Magpie resins are able to deliver superior performance in extreme conditions including:

- Wide ranges of pH inc. concentrated acid
- Highly oxidizing conditions
- High salinity

“Selectivity is the key to any successful recycling process, and it is selectivity that makes Magpie stand-out from its substitutes”

Dr. Steve Van Zutphen, CEO

EXAMPLES OF SPECIFIC APPLICATIONS:

Typical solutions on which MPX-series resins give excellent performance and high yield of PGM recovery:

PGM removal in silver refining processes

Solution contains: 10-15% HNO₃, Cu (> 30g/l), Ni, Fe, and Sn with traces of Pt, Pd, Rh, Ru, and Au.

- MPX-310 captures **98%** of PGM
- **None** of the other elements are captured

PGM removal from oxidizing acids

Solution contains: 15-20% HCl, Cu (> 60g/l), Ni (2 g/l), Zn, and Pt/Pd (45mg/l)

- MPX-317 captures **97%** of Pt and Pd
- **None** of the other elements are captured

Highly selective gold recovery

Solution contains: Ca (>8g/l), Mg, Na, Al, Cu, Fe, Pb, and Au (4.5mg/l)

- MPX-318 captures **99%** of Au
- **None** of the other elements are captured

MAGPIE'S TECHNOLOGY

Metal recovery

The purely organic support of the MPX-series make them compatible with standard fuming or incineration processes where the metals are recovered from ashes as illustrated below



“Stable phosphine oxides form coordination bonds between our resin and the target metals, which yields distinct bond strength and remarkable selectivity”

Dr. Vladica Bocokic, Head of R&D

Physical Properties

Physical form	Off-white macroporous beads, containing 10-15% water
Functional group	Various bidentate / phosphine oxide
Max. absorption capacity	1.5 to 1.9 mol/l
Particle size	0.5-1.0 mm
Swelling properties	13-30 vol %
Density	1.1 kg/l
Storage	Stable at temperatures between 5-40°C. Freezing temperatures can damage the beads permanently. Maximum storage 2 years.

Recommended Operating Conditions

Operating temperature	0 < 80°C
Temperature resistance	< 200°C
Flow for packed-bed	< 10 BV/h
Performs well in	5-25% HNO ₃ , 20% HCl or HCl/HNO ₃
Operating pH	0 - 8
Metal Recovery Process	Fuming, incineration

NEXT STEPS

- Send us a sample of your effluent and get the performance lab results of the MPX resins, or
- Visit our website at www.magpie-polymers.com, fill out the Preliminary Assessment Form and you will receive our expert's opinion on your specific case free of charge



Magpie
Polymers

www.magpie-polymers.com

108 avenue Carnot
77140 Saint Pierre Les Nemours

info@magpie-polymers.com
+33(0)1 64 28 90 78

Disclaimer:

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