

IMWA 2010 / 09 / 07



Metals in water

- Transition metals in water present a problem and an opportunity
- Magpie Polymers combine clean-up and purification
 - **Clean-up** may be required from health and safety or environmental point of view
 - **Purified** heavy metal streams have high market value



Removing dissolved metals from water

→ Precipitation

- ✓ Cheap
- ✗ Produce sludge waste

→ Ion-exchange resins

- ✓ Effective for many metals
- ✗ Limited selectivity at higher price

→ Reverse Osmosis

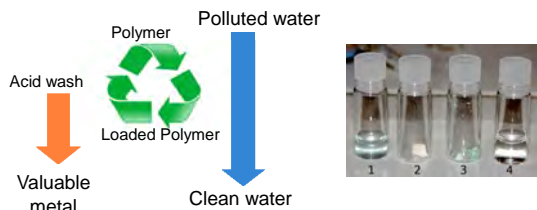
- ✓ Low residual concentrations
- ✗ High energy consumption, limited selectivity



→ Magpie Polymers proposes a range of different products:

- **Different chemical forms**
 - **selective** capture heavy metals
- **Different physical forms**
 - powders, beads, membranes or surfaces

→ **Replace** existing products **without** process change



Properties and Advantages

High selectivity

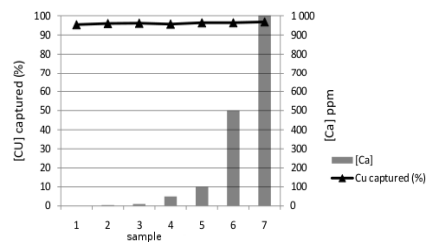
- Effective in water with high Total Dissolved Solids
- Obtain metal of interest in high purity

Magpie 101	Magpie 102	Magpie 103	Not captured
Copper	Gold	Under development	Sodium
Nickel	Lead		Calcium
Palladium	Zinc		Magnesium
Chromium	Cadmium		
Platinum	Uranium		
	Gallium		

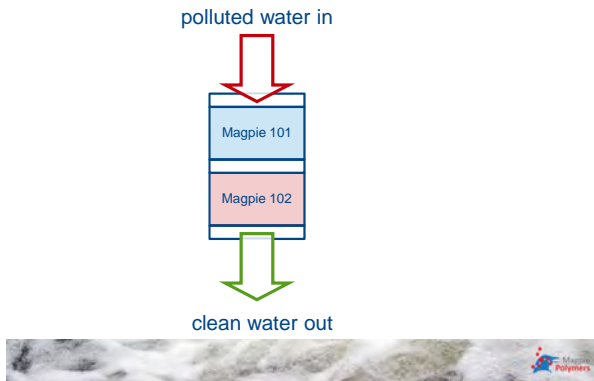


Transparent to Calcium

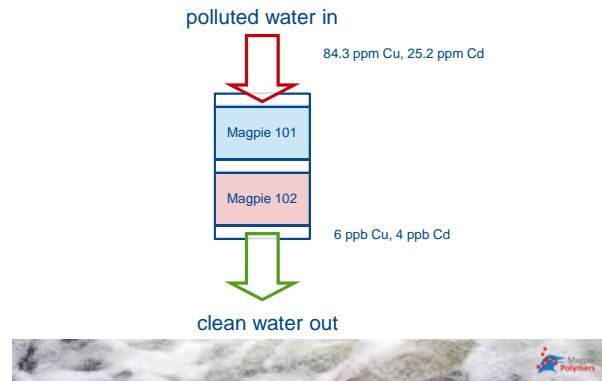
- **Copper capture in the presence of Calcium** run with 7 different samples containing between 0 and 1000 ppm of calcium and 100 ppm of copper.
- V = 20 cm³, pH 6.0, 200 mg of polymer, for 30 min.



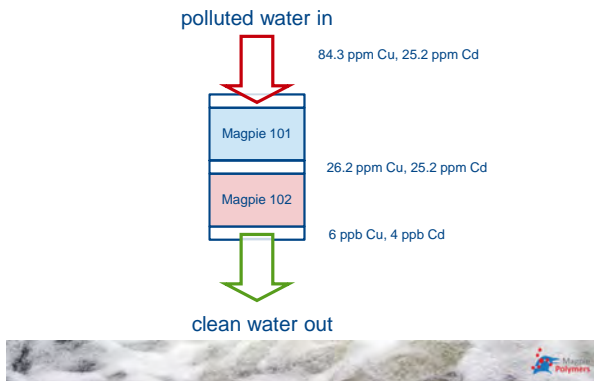
Stepwise metal removal: Copper Cadmium



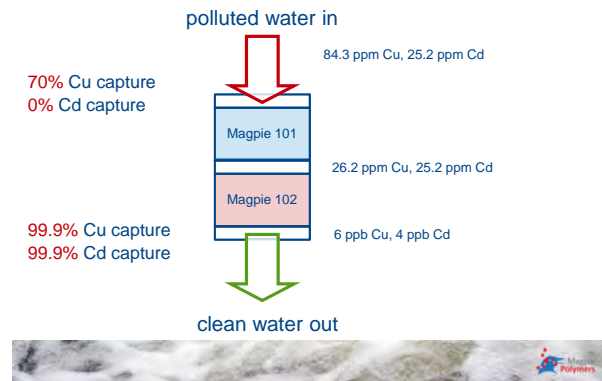
Stepwise metal removal: Copper Cadmium



Stepwise metal removal: Copper Cadmium



Stepwise metal removal: Copper Cadmium



Periodic system

Magpie 101

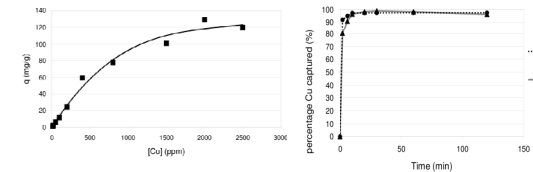
Magpie 102

Magpie 103

Not Captured

Properties and Advantages

- High capture capacity and fast kinetics
- Smaller bed size, lower pressure drop, cheaper regeneration
- High stability and active at low pH
 - Stable in pH 0-14, <200 °C and organic solvents, active at pH > 2
- Low residual concentrations (from 100s ppm to ppb)



Saturation with copper: more than 100 mg of metal per gram of polymer.

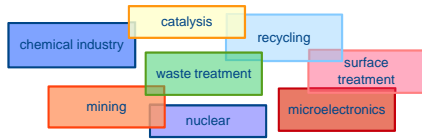
Kinetics of copper capture: complete within 10 min of contact.

Market opportunities

→ Magpie Polymers act at **three** levels:

1. Metal removal
2. Metal recovery
3. Process improvement

→ Ongoing market study to define 1-2 **niche** markets:



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project leader
Etienne Almorik
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Kieren McCloskey
technician synthesis and testing

Office in Fontainebleau
Laboratory at Ecole Polytechnique

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Expert Coordination Chemistry
Haad Bessbousse, PhD
Expert Water Purification

Business Advisers
in banking, local politics
and chemical industry



Conclusion and future prospects

- **Capture** characteristics of Magpie Polymers unique
- We are able to **produce** different polymers on large scale
- **Expand** our product understanding
 - test with model and real solutions
- **Define** value proposition and start market development



Road-map

