Assessment of a gold absorbing resin in natural groundwaters for mineral exploration

N. Reid[1]*, D.J. Gray[1] and A. Lucas[2]

[1] Deep Exploration Technologies Cooperative Research Centre, CSIRO Earth Science and Resource Engineering, Kensington, Western Australia, Australia (*correspondence: nathan.reid@csiro.au)

[2] School of Earth and Environment, University of Western Australia, 35 Stirling Highway, Crawley 6009, Western Australia

One of the most important elements for mineral exploration is gold, and yet it is one of the hardest to accurately measure in groundwater. Recent successes in regional hydrogeochemistry in Australia [1] has highlighted the potential of using activated carbon via both grab sampling and a newly modified Diffusive Gradients in Thin films (DGT) technique [2] to gain low level detection of Au (and other elements) as increasing concentraions of Au can vector to large mineral systems. A question we are addressing is whether the Au signal can be concentrated and/or improved by the use of specific Au absorbing resins.

We used Micro-CT tomography to determine how a specific resin, Purolite A100, absorbs both ionic and metallic Au from solutions, and precipitates it both on and within the resin structure.

Preliminary results show that Purolite A100 absorbs more Au (and also Ag, Bi, Pt and Pd) than activated carbon and gives more consistent results at higher concentrations.

Further research is still required for improving the absorbance of Au at lower Au concentrations.

[1] Gray *et al*. (2009) *Geological Survey of Western Australia Record* 2009/21, ISBN 978-1-74168-280-9. [2] Lucas *et al*. (2012) *Anal. Chem.* **84**: 6994-7000.

Investigating the physicochemical gradients in oil sands wastes

Thomas Reid[1]*, Ryan Boudens[1] and Chris Weisener[1]

[1] GLIER - University of Windsor, Windsor, Ontario, Canada *(reid11c@uwindsor.ca)

The Athabasca Oil Sands contain one of the world's largest oil reserves consisting of approximately 178 billion barrels of oil[1]. With 20% recoverable through open pit mining methods, this extraction process produces a considerable amount of fluid fine tailings (FFT) waste material, which must be deposited on site in tailings ponds. These ponds allow the waste sands, clays, residual bitumen and water to settle out, allowing for the water to be recycled for use again in the extraction process. It is vital to understand the physicochemical gradients which form in these tailings ponds over time, with the goal of remediation once the ponds are no longer needed.

To study the influences of biotic and abiotic processes on fresh and mature FFT, sensitive microsensor profiling techniques are being used to measure hydrogen sulphide (figure 1), oxygen, Eh, and pH profiles over a 1 year period. These profiles are accompanied by pore water extraction methods to analyse cation, anion and pore water gas expression. To compliment these static experiments, dynamic simulations will investigate shear forces (wave action and turbulence) on the water-sediment interface in each of the biotic and abiotic microcosms, under controlled atmospheric conditions.

This holistic study provides insight regarding biotransformation and physicochemical controls effecting sediment oxygen demand associated with remediated wetlands & end pit lake development.

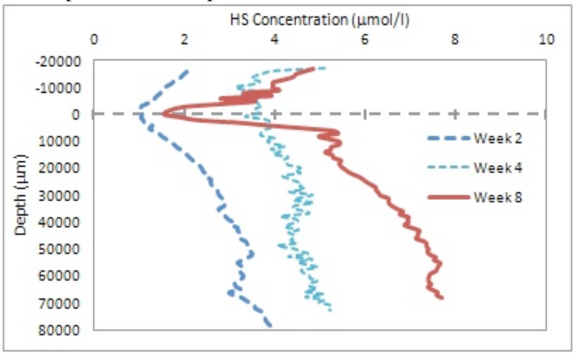

Figure 1: HS^- concentration profiles of mature FFT at 2, 4, and 8 weeks, extending from cap water down into the FFT sediment; dashed line is the sediment-water interface

[1] Canada National Energy Board. Canada oil sands: opportunities and challenges to 2015. An energy market assessment. Calgary: Publications Office, National Energy Board; 2004.

DOI:10.1180/minmag.2013.077.5.18