

The Use of a Gold Absorbing Resin for Regional Hydrogeochemical Exploration, Towards the Capricorn Orogen, Western Australia

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One of the most economically important elements for mineral exploration is gold, and yet it is one of the hardest to measure accurately in groundwater. Groundwater is becoming an increasingly useful sample media for exploration through cover. Gold is typically below direct detection limit (commonly <1 µg/L) for most waters and concentrations further decrease with increasing distance from a deposit (i.e., at regional scale). Recent successes in regional hydrogeochemistry in Australia has highlighted the potential of using activated carbon to gain low level detection of Au (and other elements), with increasing concentrations of Au vectoring 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.

Solution ICP-MS detection limits are generally accurate for Au above 1 µg/L. Dissolved Au concentration in groundwaters is often in the low ng/L range, so a 1000 times preconcentration is generally required to confidently measure Au content. To do this we use 1 g of absorbant (carbon or Purogold resin) in 1 L of water, and if there is complete or almost complete adsorption onto the sachet, then that gives a 1000 times concentration on the sachet.

Both carbon and Purogold are very efficient at removing Au from solution. Examinations of both materials under Scanning Electron Microscope (SEM) show that both adsorb Au over the surface of the material only but the processes differ. Carbon dosed with very high concentrations of Au (~0.1%) show bright spots all over the surface of the carbon like a light dusting. Purogold A193 behaves similarly in that all the Au is bound to the surface, but in this case the Au is unevenly distributed and forms macroscopic nuggets of Au on resin. Closer-scale investigations using a Field Emission Gun SEM (FEG-SEM) show that the nucleation of the Au appears to occur on surface blemishes of the Purogold bead and once this process starts the Au continues to accumulate on these blemishes and etches into the surface of the bead, as if the blemish acted as a catalyst for the reaction.

This procedure was further tested in the Capricorn orogen of Western Australia to determine how this resin would perform for regional hydrogeochemical mineral exploration. This is an ongoing project with results still coming in, the results of which could highlight new areas for Au exploration in this region.