Gold Processing Services

Optimising gold recovery by cyanidation

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CSIRO has for many years been developing capabilities and providing services to the gold industry to improve and optimise cyanidation performance through increased gold recovery and reducing costs. These capabilities and services provided are outlined below.

Process Optimisation

Process plant reviews by our team of experts include process performance evaluations and improvement recommendations with respect to:

- Cyanide analysis and deportment
- Reagent optimisation
- Carbon management
- Cyanide destruction
- Cyanide recovery
- Deportment of elements, such as Ag and Hg

Reviews by our team can include training and workshops to enhance metallurgist, operator and laboratory staff knowledge and abilities to troubleshoot and optimise the process plant.

Cyanide analysis and deportment

Optimisation of the cyanidation process requires accurate cyanide analysis and deportment information. The CSIRO team can:

- Provide knowledge of the cyanide species measured by the various analysis method(s), including online and laboratory techniques
- Assess analysis methodology, accuracy, detection limit and possible interferences
- Conduct detailed cyanide speciation analysis to cross check plant data and provide additional analysis information
- Reconcile cyanide analyses (Free, WAD and Total cyanide) with metal analyses
- Identify opportunities to reduce and minimise cyanide losses

Reagent optimisation

Optimisation of reagent addition for cyanidation is non trivial, particularly for circuits treating complex ores with pre-oxidation and/or cyanide destruction. Our team of experts can assist by:

- Interpretation and optimising process steps and the interaction between them
  - ➢ eg. Optimising pre-oxidation and cyanidation whilst minimising cyanide and other reactive species concentrations entering cyanide destruction
- Detailed speciation analysis to aid optimisation
- Optimising cyanide to oxygen ratios and leach tank profiles
- Reducing cyanide addition through staged addition and cyanide recycle

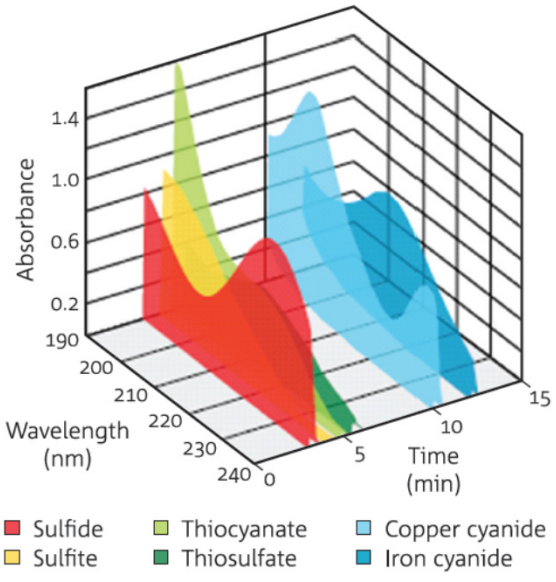

Figure 1: Enhanced species identification and quantification by HPLC analysis

Carbon management

CSIRO has worked with industry for many years and has developed a wealth of experience and knowledge in carbon management to optimise gold recovery. The team can assist to review and optimise:

- Gold recovery and minimise solution losses
- Carbon movement and operating philosophy
- Adsorption tank profiles
- Plant adsorption kinetics and stage efficiencies
- Carbon circuit maintenance/conditions
  - ➢ Minimise impact of foulants
  - ➢ Efficient and effective acid wash, elution, regeneration and wash stages
- Monitoring and reconciling plant data against laboratory data
- Processing high silver and copper ores

Reviews and troubleshooting performance issues are aided by CSIRO's testing and assessment of site carbons which includes:

- PSD and bulk density
- Ball pan hardness and attrition
- Moisture and ash content
- Elemental analysis
- Foulant identification by TGA/MS
- Loading kinetics (activity) and capacity (isotherms)
- Thermal regeneration and off gas analysis

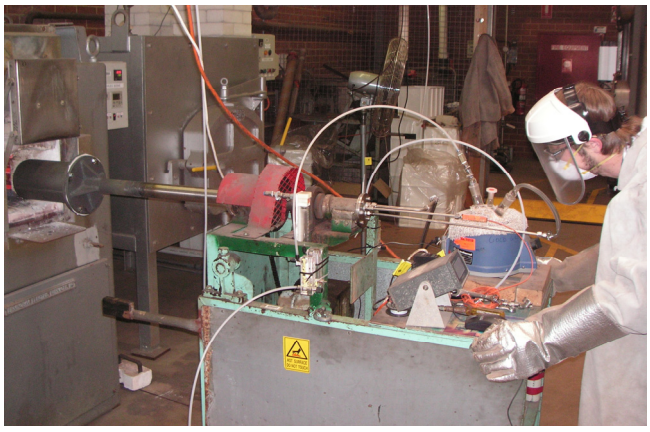

Figure 2: Rotary pot and furnace for regeneration of carbon

Cyanide destruction

Our team conducts process reviews and testwork for INCO (SO_2/air), hydrogen peroxide and Caro's acid processes to:

- Optimise reagent addition
- Determine solids and/or solution species impacts
- Troubleshoot cyanide measurement and interferences associated with these processes
- Evaluate oxygen transfer in the INCO process and provide engineering improvements
- Integration with cyanide recovery processes to meet discharge requirements

Cyanide recovery

Our team has expertise in SART, AVR and gas membrane processes for cyanide recovery from solutions. Services include:

- Evaluation / development / optimisation of process
- Laboratory evaluation and comparison of recovery processes
- Integration with cyanide destruction processes

The team has also developed ion exchange resin and activated carbon technologies for recovery of copper and cyanide from slurries.

Deportment of elements

The deportment of other valuable elements or those of HSE concern is paramount today. CSIRO can assist or conduct:

- Deportment survey
- Sample collection, preservation and analysis
- Metal/element speciation
- Evaluations of recovery/removal options

For further information or to discuss how the CSIRO team can assist in optimising your cyanidation process, please contact:

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