ACTIVOX® - LOW TEMPERATURE & PRESSURE OXIDATIVE LEACHING

SGS MINERALS SERVICES

SGS Lakefield Oretest Pty Ltd (SGS) was originally founded in 1993 as Oretest Pty Ltd. SGS has since developed into a major metallurgical services organisation located in a purpose-built laboratory in Perth, Western Australia.

The laboratory is dedicated to providing high quality metallurgical testing across the broad spectrum of the minerals industry including:

- Gold ores
- Nickel laterites
- Base metal
- Iron ore
- Mineral sands
- PGM ores
- Rare-earths and other exotics
- Diamond ores
- Environmental services

SGS provides a comprehensive range of test work capabilities including bacterial leaching, crushing, screening, grinding, ultra fine grinding, gravity, magnetic & electrostatic separation, solvent extraction, electrowinning, flotation, pressure leaching, pressure oxidation, pressure acid leach and cyanide speciation. Pre-feasibility studies, on-site diagnostic metallurgical services, environmental testing and analytical services are also included in our range of capabilities.

Introduction

Pressure oxidative leaching is a well established technology which is used for processing base metal sulphides (eg nickel, copper and zinc) and for treating refractory gold ores and concentrates. Conventional pressure oxidation operates at temperatures exceeding 200ºC with overpressures of 2200 kPa or more. The technology is robust and reaction rates are fast.

Activox® is a form of pressure oxidation which operates at milder conditions of temperature and pressure; e.g. 95 – 100ºC and 1000 kPa. The milder operating conditions simplify the engineering requirements and reduce costs, yet maintain the advantages of pressure oxidation.

The Activox® process was first tested in 1991 and since that time, extensive testing has been conducted resulting in the further development of the technology. One of the major developments was the successful application of Activox® to the leaching of chalcopyrite concentrates.

Activox® is essentially a simple, yet novel, approach to pressure oxidation. The process combines fine milling (using a suitable power-efficient stirred mill) with low temperature pressure oxidation. Control of the pulp chemistry is important to optimise metal dissolution, break down sulphides, achieve selectivity and minimise oxygen consumption. The process has been described in a number of publications[1].

SGS has made a major commitment to provide a "one-stop-shop" for clients who wish to evaluate the use of Activox® technology, from preliminary batch testing to fully integrated continuous pilot testing including cyanidation, solvent extraction and electrowinning, as well as data interpretation, preliminary costing, engineering and feasibility studies.

SGS is able to back-up all Activox® testing with the services of their metallurgical laboratory (including assaying) and is also able to evaluate alternative technologies like conventional pressure oxidation, bacterial oxidation and roasting.

FACILITIES AT SGS FOR ACTIVOX

The main facilities at SGS for providing Activox® testing are:

- **Fine milling**, carried out using vertical stirred mills.
- **Pressure leaching** on a batch basis, using two titanium autoclaves; these are each around 3.5 L capacity.
- **Pressure leaching** on a continuous basis can be tested using SGS's state-of-the-art pressure autoclave pilot plant. This is a fully integrated facility consisting of feed control, four-stage autoclave (25 L), neutralisation, CCD circuit and downstream mixing/holding tanks. The plant is well instrumented for control and data logging purposes. The autoclave section has been specially designed to give accurate mass and heat balances and is extremely versatile with respect to testing various parameters like temperature profiles, retention times, oxygen flows, etc.

SGS carries a comprehensive range of other equipment, operated by experienced staff, to provide back up to Activox® test programmes, eg:

- Feed preparation – crushing, milling, sampling etc.
- Concentrates production – flotation (batch and continuous pilot), gravity, magnetic separation.
- Cyanide leaching; batch and continuous.
- Solid/liquid separation - settling and filtration, batch and continuous.
- Solvent extraction – batch and continuous mini-plant facilities.
- Electrowinning – small scale to large scale, both batch and continuous. A full-sized nickel cathode test facility has been operated.

[1] Angove J E, Corrans, I J and Johnson, G D, 1993. The Recovery of Nickel and Gold from Sulphide Concentrates, in *Proceedings of the XVIII International Mineral Processing Congress*, pp 1227-1231 (AusIMM:Sydney).

Corrans, I J, Angove, J E and Johnson, G D, 1995, The Treatment of Refractory Copper-Gold Ores using Activox® Processing, in *Randol Gold Forum Perth '95 - Gold Metallaurgy & Environmental Management*, pp 221-224 (Randol International Ltd:Perth).

Johnson, G, Corrans, Ian and Angove, J, 1993. The Activox® Process for Refractory Gold Ores, in *Randol Gold Forum 1993 Proceedings*, pp 183-188, (Randol International Ltd:Beaver Creek).

ACTIVOX® AND ASSOCIATED TESTWORK

- Batch leaching of a large range of concentrates has been carried out since 1992. SGS has built up valuable experience on how to optimize the oxidation and leaching of various sulphide minerals, including those containing copper, nickel, cobalt, zinc, arsenic and gold.
- Continuous pilot testing including leaching, neutralisation, CCD, precipitation, solvent extraction and electrowinning has been carried out on a number of nickel/copper/cobalt ores.
- Solvent extraction programmes, both batch and continuous, have been carried out on copper, nickel and cobalt using various circuit designs and reagents

MAJOR CLIENTS HAVE BEEN:

- Dominion Mining Ltd;
- Avmin (South Africa);
- WMC Resources;
- Straits Resources;
- Newcrest Mining Ltd;
- Anglo American Corporation
- Kalgoorlie Consolidated Mines;

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