EARTH SYSTEMS
Environment · Water · Sustainability

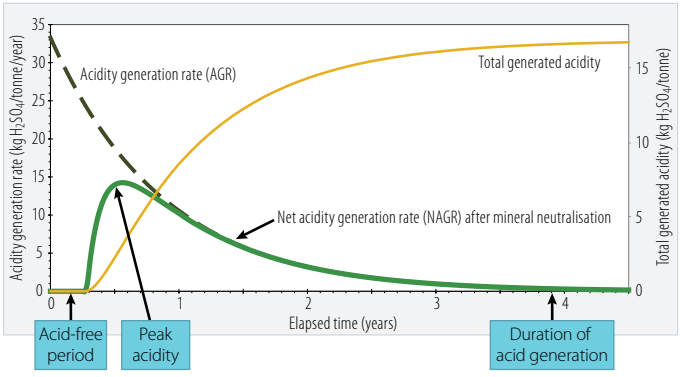
Rapid Kinetic Geochemical Testing for AMD Prediction – OxCon and OPT

Earth Systems provides advanced, rapid kinetic geochemical tests for prediction of the rate of acid and metalliferous drainage/acid rock drainage (AMD/ARD) generation associated with sulfidic materials at mine sites and acid sulfate soils. Earth Systems' proprietary *OxCon* oxygen consumption test and Oxygen Penetration Test (OPT) represent the latest and most accurate means available for characterising AMD-related acidity generation rates for AMD management planning.

The management of AMD requires the characterisation of soil/rock samples based on static and kinetic geochemical testwork. Static geochemical tests, such as measurements of sulfur content and acid neutralisation capacity (ANC), provide information on the maximum potential AMD risk for the sample material. Kinetic geochemical tests provide information on the likely *rate* of AMD generation and neutralisation — information vital for the development of AMD management plans.

Earth Systems has developed an advanced, rapid oxygen consumption test technology called *OxCon* for the accurate estimation of sulfide oxidation rates and acidity generation rates for sulfidic geological materials. Similar tests have been used by research organisations such as ANSTO for many years. *OxCon* provides faster, more accurate and more cost-effective determinations of sulfide oxidation rates compared with existing methods such as column leach and humidity cell tests, and provides superior accuracy, reliability and representativeness compared with other oxygen consumption methods.

The *OxCon* test determines the intrinsic rate of oxidation for sulfidic materials by direct measurement of oxygen consumption by the material over time. In combination with the detailed mineralogy and geochemistry of the sample, this 'snapshot' taken over 2–6 weeks gives the annual rate of acidity generation, the reactive lifetime of the material, and rate of rate of ANC consumption. This information is pulled together in a graphical output (see below) that puts key management metrics at your fingertips, clearly showing the acid-free 'lag' period before the onset of acid conditions for acid-forming samples, the timing and magnitude of peak acidity, and the longevity of acid generation.



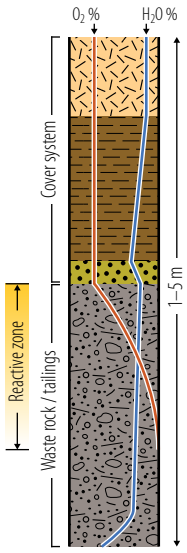
BENEFITS OF OXCON

- Rapid determination of oxidation rates (usually 1–4 weeks) compared with column leach and humidity cell tests, which usually take many months to years.
- Lower cost relative to other techniques due to significantly lower analytical costs and shorter test durations.
- Vastly improved accuracy of sulfide oxidation rates by direct measurement of oxygen consumption due to sulfide oxidation.
- Testing under field or specific test conditions in terms of moisture content, temperature, solar radiation, particle size, cover materials, temperature, and more.
- Small sample size (typically 2–5 kg) and suitability for scaling to larger or smaller samples with relative ease.
- The oxidation rate is reported as a reactive sulfide 'half-life' and annualised Pyrite Oxidation Rate (POR), as well as in various conventional units, which allows the result to be applied directly to bulk average materials — a result with direct management utility.

OXYGEN PENETRATION TEST (OPT)

The intrinsic oxidation rate is only part of the story, however. Our full-scale OPT columns allow entire vertical sections of up to 5 m or more of waste material, with or without full-scale cover systems, to be tested in the laboratory under simulated field conditions. This determines the thickness of the 'reactive zone', from which actual dump-scale acidity generation rates can be calculated.

Using the OPT column it is possible to directly test the geochemical performance of proposed closure strategies such as covers for waste rock dumps and tailings storage facilities, replacing or augmenting conventional modelling approaches. The relative performance of different strategies can be compared directly under carefully controlled conditions, and the parameters of each cover component can be optimised to minimise cost and maximise long-term geochemical stability.



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