

**BACTERIAL LEACHING OF PYRITIC GOLD ORES**

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Gold-containing pyritic ores (pyrite, pyrrhotite, arsenopyrite) are usually refractory to cyanidation. Concentrates can be obtained by flotation, with grades in excess of 50 g Au/t, but recovery of the gold requires the removal of the sulphur from the ore. This can be achieved by roasting (which produces sulphur dioxide emissions), pressure oxidation (expensive and thus only suitable for large high grade deposits), pressure leaching (not currently commercial) or bacterial oxidation.

The bacterial oxidation process is well known in nature but has only recently come under investigation as a viable and relatively clean method of gold recovery from ores. However there is currently little information about the process at an atomic scale. It is known that the bacterial attack progresses preferentially along grain boundaries which is precisely where the gold has been deposited from aqueous infiltration.

Samples have been obtained from the Wiluna mine in Western Australia consisting of the original ore, 2 pre-treatments, and from six successive bacterial reactors. <sup>57</sup>Fe Mössbauer spectra taken at room temperature show only two quadrupole split doublets which can be ascribed to pyrite, FeS<sub>2</sub>, and arsenopyrite, FeAsS. However, the presence of any superparamagnetic oxide or oxyhydroxide species would be expected to give a spectrum very similar to that of pyrite and would be undetectable in small quantities. At a temperature of 5K, a broad magnetically split sextet is observable with a mean hyperfine field of approximately 50T. This field is characteristic of magnetically ordered ferric iron surrounded by an octahedron of oxygens. The intensity and characteristics of this subspectrum alters through the series and interpretations will be given on the oxidation products of the bacterial leaching.