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## Preferential oxidation of chalcopyrite surface facets characterized by ToF-SIMS and SEM

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**Abstract:** The use of hydrometallurgical methods for the production of copper from chalcopyrite has become more attractive due to environmental drivers such as lower energy demand and less gaseous emissions such as SO2. Unfortunately, chalcopyrite is known to be a highly unreactive mineral in hydrometallurgical processes. This work reports that a freshly cleaved chalcopyrite surface exhibits highly selective reactivity depending on the exposed fracture planes. ToF-SIMS was used to qualitatively characterise various fracture planes from freshly cleaved chalcopyrite particles, prior to and after hydrometallurgical treatment (leaching). It was found that prior to treatment certain areas exhibit pronounced contamination from atmospheric hydrocarbons upon fracture, whereas others were highly unreactive and remarkably free from adventitious hydrocarbon contamination. The positive ion spectra recorded from these areas are indeed dominated by peaks from Fe and Cu elements and related compounds. The negative ion spectra for the reactive areas showed a high content of oxidised (sulphur) species. After leaching, the differences between the sites of low and high reactivity were more subtle than prior to this treatment, whereas SEM analysis showed clear evidence for selective attack of ferric sulphate to specific planes after such treatment. Attempts are made to rationalise these observations with regards to selective dissolution based on different exposed chemistries at various cleavage planes within chalcopyrite crystals .