

## **Speciation and bonding environment of copper in pyrite: Implications for bioleaching**

DAVID KOSSOFF<sup>1\*</sup>, KAREN A. HUDSON-EDWARDS<sup>1</sup>,  
SANTINI, J. M.<sup>2</sup>, NWAObI, B.<sup>2</sup>, XYDAS, C.<sup>3</sup> AND  
MESSIOS, N.<sup>3</sup>

<sup>1</sup>Dpt. Earth and Planetary Sciences, University of London,  
Birkbeck, Malet St, London WC1E 7HX, UK. e-mail:  
(\*jkoss02@mail.bbk.ac.uk; k.hudson-edwards@bbk.ac.uk)

<sup>2</sup>Institute for Structural & Molecular Biology, University  
College London, Gower St., London WC1E 6BT, UK.

<sup>3</sup>Hellenic Copper Mines, Cyprus

Bioleaching is an important technique for recovering copper (Cu) from ores. In this study, we report the results of the bonding and speciation of Cu in pyrite from the active Skouriotissa, Cyprus, deposits. Analyses were carried out using reflected light microscopy, electron microprobe microanalysis (EPMA) and X-ray absorption near-edge structure (XANES) techniques. Pyrite is a ubiquitous component of the Skouriotissa ores and similar ores from other Cu bioleaching operations. The oxidation of pyrite is autocatalytic, as Fe(III) ions and heat are produced, which in turn can oxidise more pyrite and chalcopyrite. Our analyses suggests that most of the Cu in the Skouriotissa pyrite occurs as minute Cu(I)-bearing sulphide and oxide inclusions, and not as Cu(II) substituting for Fe(II) in pyrite. This has implications for the bioleaching process, since the contact between pyrite and these Cu-bearing phases will result in galvanic coupling and more rapid dissolution of the Cu-bearing phases compared to the pyrite. Similar Cu-bearing mineral inclusions and galvanic leaching might occur in Cu ores elsewhere in the world that are used for bioleaching. We also have evidence that some Cu(II)- bearing pyrite might be present in the Skouriotissa ores, and if so, this Cu may not be as easily leached as the Cu-bearing inclusions.