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Influence of X-ray µ-Computed Tomography on the microbial activity of a mixed thermophilic and mesophilic bioleaching culture colonising a mineral surface

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Research Highlights:

- Evaluation of the compatibility of X-ray µCT imaging and bioleaching microorganisms
- Suspended thermophiles unaffected at energy doses of 35-90 kV and 200-280 µA
- Detrimental effect on suspended thermophiles exposed at 120 and 150 kV
- Mesophile activity on pyrite mineral surface unaffected by lower energy X-ray µCT

Abstract

X-ray micro-Computed Tomography (X-ray µCT) allows for non-invasive 3D investigations of heap leaching processes. It permits study of mineral liberation, pore network structure in particles or beds, and bioleaching of non-surface mineral grains. A premise for bioleaching studies integrating X-ray µCT is that the metabolic activity of microorganisms is not affected by X-ray energy doses. This study therefore evaluates the compatibility bioleaching microorganisms with X-ray energy exposure. The X-ray effect on a mixed thermophilic culture suspended in solution was assessed using imaging conditions of 35-150 kV, 200-280 µA and 1-2 hours. Microorganisms were unaffected between 35-90 kV and 200-280 µA while there was some detrimental effect at 120 and 150 kV. The X-ray influence on a mixed mesophilic culture colonising a mineral surface was investigated at 90 kV and 225 µA for a 1 hour exposure time. The system was monitored before and after exposure through