Characterization of elemental sulfur in chalcopyrite leach residues using simultaneous thermal analysis

A key component in the atmospheric leaching of metal sulfides is the oxidation of sulfide to either elemental sulfur or hexavalent sulfur. The final oxidation state of sulfur significantly influences the economic viability of a leaching process because of its effects on oxygen consumption, acid generation, and surface passivation. Thus, in the process of developing new leaching technologies, it is important to both characterize and quantify the sulfur oxidation products. In this work, a new method based on Simultaneous Thermal Analysis (STA) is established for the quantification and thermal characterization of elemental sulfur in chalcopyrite leach residues. The STA method refers to the simultaneous application of thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). The DSC measurements yield information on phase transformation, which can be used to identify the sulfur allotropes. The linear relationship between the melting enthalpy of β-sulfur determined by DSC and the sulfur content determined by TGA is expediently used to quantify the unknown sulfur content in leach residues.

General information
Publication status: Published
Organisations: Department of Chemical and Biochemical Engineering, CHEC Research Centre, Technical University of Denmark, Chinese Academy of Sciences
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Pages: 22-30
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Hydrometallurgy
Volume: 188
ISSN (Print): 0304-386X
Ratings:
BFI (2019): BFI-level 1
Original language: English
Keywords: Allotrope, Chalcopyrite leach residue, Elemental sulfur, Quantification, STA
DOIs:
10.1016/j.hydromet.2019.05.020
Source: Scopus
Source-ID: 85066950019
Research output: Contribution to journal › Journal article – Annual report year: 2019 › Research › peer-review