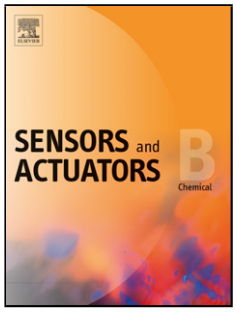

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Reagent-free flow-injection amperometric sensor for quantification and speciation of iron for bio-hydrometallurgical applications

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Abstract

Iron ions are monitored in processes such as bio-leaching, bio-oxidation, ferric leaching, passivation control, and others. The role of iron in different hydrometallurgy processes is very important because it affects strongly several industrial ore production, as chalcopyrite cooper extraction. In this work we present an amperometric FIA system that allows rapid quantification and speciation of iron in bio-mining processes. Linearity range, passivation of the working electrode and interferences were studied. We found a useful lineal range from 10 to 1500 mgL^{-1} for each of the ions, with a detection limit (Fe^{2+} and Fe^{3+}) determined at 15±2 mgL^{-1}. High copper concentrations could interfere with the amperometric readings, though not in the copper/iron relationship encountered in this industry. Real samples, including an acid mine drainage sample, and the monitoring of the bio-oxidation kinetics of iron by *Acidithiobacillus ferrooxidans* were also quantified. In all cases, our results were compared with a standard colorimetric method that allows iron speciation (1,10-phenanthroline), showing good agreement between both methods. The electrochemical method presented here allows high sample throughput (ca. 45 samples h^{-1}), fast analysis (ca. 1 min), and reagent free quantification of total iron, ferric and ferrous ions.

Keywords: *Acidithiobacillus ferrooxidans*, Bio-hydrometallurgic, Electrochemistry, Ferric ion, Ferrous ion