

<<有色金属生物冶金>>

图书基本信息

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### 内容概要

《普通高等教育"十二五"规划教材:有色金属生物冶金》主要包括:有色金属生物冶金技术基础、冶金方法、工艺特征和工业应用(提取金、铜、镍、锌)。

文中均加以简要注释,以方便自学。

书后附相关专业词汇。

有色金属生物冶金主要采用生物技术来对矿物中的有色金属进行富集、分离、提取和回收利用,通常由微生物来进行矿石的细菌氧化或生物氧化。

生物冶金工艺成本低、污染少、资源利用率高,目前已应用于难处理金矿、铜硫化矿等。

生物冶金具有超过常规处理贫矿的技术优势,正发展成为国际上有色冶金研究的热点之一。

## 书籍目录

1 Biohydrometallurgy and Bacteria 1.1 Introduction 1.2 Development in Hydrometallurgy 1.3 Bacteria and Phylogeny 1.4 Nutrition 1.4.1 Carbon nutrition sources 1.4.2 Nitrogen nutrition sources 1.5 Energy Sources 1.5.1 Iron oxidation 1.5.2 Sulfur oxidation 1.5.3 Electron donors and electron accepters 1.5.4 Mineral oxidizing ability 1.6 Mesophilic and Acidophiles in Mineral Bioleaching 1.7 Summary Questions Note 2 Surface Chemistry of Bacterial Leaching 2.1 Introduction 2.2 Adhesion and Attachment of Bacteria to Mineral Surfaces 2.3 Theory of Bacterial Attachment to Surfaces 2.4 Biofilm Colloid Formation on Bacterial Cells 2.5 Summary Questions Note 3 Electrochemistry of Mineral Dissolution and Bioleaching 3.1 Introduction 3.2 Electrochemical Mechanism of Oxidative and Reductive Reactions 3.2.1 Anodic and cathodic reactions 3.2.2 Influence of the electronic structure of the mineral on the dissolution rate 3.3 Applications of Electrochemical Mechanism in Leaching 3.3.1 Chemical leaching of pyrite by ferric ions 3.3.2 Effect of bacterial action on the mixed potential of pyrite 3.3.3 Effect of electrochemical bioleaching on the copper recovery 3.4 Electrochemical Kinetics and Modeling 3.4.1 Kinetics of the oxidative dissolution of sphalerite 3.4.2 Electrochemical kinetics and model of bacterial leaching 3.5 Summary Questions Note 4 Biohydrometallurgy of Copper 4.1 Introduction 4.2 Definitions and Mineralogy Related to Copper Leaching 4.2.1 Pyrite 4.2.2 Secondary sulfides 4.2.3 Primary sulfides 4.3 Physico-Chemical Leaching Variables 4.3.1 Surface area 4.3.2 Acid levels 4.3.3 Oxidants 4.3.4 Agglomeration 4.3.5 Curing time 4.3.6 Permeability 4.4 Bacterial Leaching Variables 4.4.1 Acidity 4.4.2 Oxygen 4.4.3 Nutrition 4.4.4 Heat 4.4.5 Mineralogy 4.4.6 Bacterial inoculation 4.4.7 Iron 4.5 Heap Operating Variables 4.5.1 Irrigation distribution 4.5.2 Solution stacking 4.5.3 Solution collection 4.5.4 Pad stacking/configuration 4.6 Leach Solution Processing 4.6.1 Copper cementation 4.6.2 Direct electrowinning 4.6.3 Solvent extraction 4.6.4 Electrowinning 4.7 Commercial Installations and Environmental Considerations 4.7.1 In situ leaching 4.7.2 Dump leaching 4.7.3 Heap leaching 4.8 Summary Questions Note 5 Biooxidation of Gold-Bearing Ores 5.1 Introduction 5.2 BIOX~ Bacterial Culture 5.3 Chemical Reactions and Process Control 5.3.1 Chemical reactions 5.3.2 Influence of ore mineralogy 5.3.3 Effect of temperature and cooling requirements 5.3.4 pH control 5.3.5 Oxygen supply 5.4 Operations Conditions and Process Requirements 5.4.1 Bioreactor configuration 5.4.2 Rate of sulfide mineral oxidation and gold dissolution 5.4.3 General process requirements 5.4.4 Effects of chloride and arsenic on BIOX~ process 5.5 Summary Questions Note 6 Biohydrometallurgical Processing of Cobalt, Nickel and Zinc 6.1 Introduction 6.2 Cobalt Bioleaching with Autotrophic and Mixotrophic Bacteria 6.3 Nickel Bioleaching with Autotrophic and Mixotrophic Bacteria 6.4 Zinc Bioleaching with Autotrophic and Mixotrophic Bacteria 6.5 Metal Mobilization by Microbially Generated Acids/Ligands 6.6 Summary Questions Note 7 Biohydrometallurgical Recovery of Heavy Metals from Industrial Wastes 7.1 Introduction 7.2 Metal Recovery from Waste Sludge and Fly Ash 7.3 Metal Recovery from Mine Waste and Nuclear Waste 7.4 Metal Recovery from River Sediments and Metal Finishing Waste Water 7.5 Summary Questions Note 8 Biohydrometallurgical Recovery of Value Metals from Secondary Sources 8.1 Introduction 8.2 Metal Recovery from Electronic Wastes 8.3 Metal Recovery from Battery Wastes 8.4 Metal Recovery from Spent Petroleum Refinery Catalyst 8.5 Summary Questions Note Appendix References

## 章节摘录

版权页：插图： There is evidence that *L. ferrooxidans* is also capable of fixing atmospheric nitrogen. Genomic DNA from the *L. ferrooxidans* type strain was reported to give a positive hybridization signal with a *nifHDK* gene probe from *Klebsiella pneumoniae*. *L. ferrooxidans* was also shown to reduce acetylene to ethylene and oxidize ferrous iron to ferric iron at low oxygen concentrations. This ability was repressed by added ammonium ions, which is indicative of the ability to fix nitrogen. The ability of *T. thiooxidans* to fix nitrogen is uncertain. No hybridization signal was obtained when a *nifHDK* gene probe from *Klebsiella pneumoniae* was used against chromosomal DNA from *T. thiooxidans* ATCC 8085, but a positive signal was obtained when a *T. ferrooxidans* *nifHDK* probe was hybridized to an unidentified *T. thiooxidans* isolate. The role of nitrogen fixation in bioleaching operations is difficult to predict. The dissolution of atmospheric ammonia in acid solutions could provide sufficient ammonium to suppress nitrogen fixation. Furthermore, nitrogen fixation is inhibited under fully aerobic conditions therefore might not occur in a well-aerated leaching operation. In the highly-aerated, high oxidation rate, BIOX tanks used to pretreat gold-bearing arsenopyrite ores, addition of a small amount of ammonia in the form of low-grade fertilizer is required to enhance mineral oxidation.

### 1.5 Energy Sources

#### 1.5.1 Iron oxidation

As stated earlier, the energy requirements for growth of both *T. ferrooxidans* and *L. ferrooxidans* are able to be met by the oxidation of ferrous to ferric iron under aerobic conditions. Work by Blake and colleagues on the components of iron oxidation in acidophilic bacteria has revealed that the ability to oxidize iron appears to have evolved several times. At least four unique iron-oxidation mechanisms exist. Two of these mechanisms are found in the mesophilic acidophiles. The pathway for iron oxidation in *T. ferrooxidans* is characterized by the presence of large amounts of the small copper protein, rusticyanin and c-type cytochromes. Rusticyanin is not detectable in *L. ferrooxidans* or in any of the moderately or extremely thermophilic iron-oxidizers. A novel red cytochrome (cytochrome 579) which is clearly different from cytochrome a-, b- or c-type hemes and not found in the other iron-oxidizers, dominates the electron transport chain of *L. ferrooxidans*. This unique cytochrome was redox active with ferrous sulfate. The components of the iron-oxidation pathway in *T. ferrooxidans* have been relatively well studied. These are a 92 kDa membrane porin, an Fe (II) oxidase, cytochrome C55v rusticyanin and a cytochrome c oxidase of the aa3-type. All the above components have been isolated and characterized, the amino acid sequence for rusticyanin has been determined and gene for the Fe (II) oxidase have been cloned and sequenced. The exact order of the components and particularly, the position of rusticyanin in the passage of the electrons is uncertain. In a recent review it has been postulated that the role of rusticyanin is to broaden the electron pathway from cytochrome C552 to the cytochrome oxidase as illustrated below.

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### 编辑推荐

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