

Hydrometallurgy Fundamentals And Applications

The Chemistry of Gold Extraction bridges the gap between research and industry by emphasizing the practical applications of chemical principles and techniques. Covering what everyone in the gold extraction and processing industries should know: Historical Developments; Ore Deposits and Process Mineralogy; Process Selection; Principles of Gold Hydrometallurgy; Oxidative Pretreatment; Leaching; Solution Purification and Concentration; Recovery; Surface Chemical Methods; Refining; Effluent Treatment; and Industrial Applications. This book is a valuable asse for all professionals involved in the precious metals industries. It will be of particular interest and use to engineers and scientists (including extraction metallurgists, mineral/metallurgical engineers, electrochemists, chemical engineers, mineral technologists, mining engineers, and material scientists), plant managers and operators, academics, educators, and students working in gold extraction in either production, research, or consulting capacities.

Materials Processing Fundamentals provides researchers and industry professionals with complete guidance on the synthesis, analysis, design, monitoring, and control of metals, materials, and metallurgical processes and phenomena. Along with the fundamentals, it covers modeling of diverse phenomena in processes involving iron, steel, non-ferrous metals, and composites. It also goes on to examine second phase particles in metals, novel sensors for hostile-environment materials processes, online sampling and analysis techniques, and models for real-time process control and quality monitoring systems.

Process metallurgy provides academics with the fundamentals of the manufacturing of metallic materials, from raw materials into finished parts or products. Coverage is divided into three volumes, entitled Process Fundamentals, encompassing process fundamentals, extractive and refining processes, and metallurgical process phenomena; Processing Phenomena, encompassing ferrous processing; non-ferrous processing; and refractory, reactive and aqueous processing of metals; and Industrial Processes, encompassing process modeling and computational tools, energy optimization, environmental and industrial design. The work distils 40+ years combined academic experience from the principal editor and multidisciplinary 14-member editorial advisory board, providing the 2,608-page work with a seal of quality. The volumes will function as the process counterpart to Robert Cahn and Peter Haasen's famous reference family, Physical Metallurgy (1996) – which excluded process metallurgy from consideration and which is currently undergoing a major revision under the editorship of David Laughlin and Kazuhiro Hanô (publishing 2014). Nevertheless, process and extractive metallurgy are fields within their own right, and this work will be of interest to libraries supporting courses in the process area. Synthesizes the most pertinent contemporary developments within process metallurgy so scientists have authoritative information at their fingertips Replaces existing articles and monographs with a single complete solution, saving time for busy scientists Helps metallurgists to predict changes and consequences and create or modify whatever process is deployed

Computer technology in the past fifteen years has essentially rev olutionized engineering education. Complex systems involving coupled mass transport and flow have yielded to numerical analysis even for relatively complex geometries. The application of such technology together with advances in applied physical chemistry have justified a general updating of the field of heterogeneous kinetics in extractive metallurgy. This book is an attempt to cover significant areas of extrac tive metallurgy from the viewpoint of heterogeneous kinetics. Kinetic studies serve to elucidate fundamental mechanisms of reactions and to provide data for engineering applications, including improved ability to scale processes up from bench to pilot plant. The general theme of this book is the latter-the scale-up. The practicing engineer is faced with problems of changes of order of magnitude in reactor size. We hope that the fundamentals of heterogeneous kinetics will provide increasing ability for such scale-up efforts. Although ther modynamics is important in defining potential reaction paths and the end products, kinetic limitations involving molecular reactions, mass trans port, or heat flow normally influence ultimate rates of production. For this reason, rate processes in the general field of extractive metallurgy have been emphasized in this book.

Treatise on Process Metallurgy, Volume 1: Process Fundamentals

An Introduction to Chemical Metallurgy

Lithium Process Chemistry

Methods and Applications

Applications, Technology and Research

Hydrometallurgy is one of the main routes for obtaining metals that are needed for society development and for our everyday life. Chapter One presents the basics of hydrometallurgy, namely its main stages leaching, purification and/or concentration of pregnant leach solutions (PLSs), and metals' recovery. Chapter Two focuses on the gold extraction processes that involve the use or addition of industrial grade oxygen to optimise the processes. In particular, it looks at how oxygen can be used to increase the throughput and/or gold recovery and make the processes more flexible. Chapter Three gives an overview of the microbially-mediated metal transformations in which iron oxides potentially provide an applicable biotechnological method for efficient removal of pollutants from ground waters and wastewaters. Chapter Four assesses the hydrometallurgical process based on leaching, deironization, and purification of bis(trifluoromethylsulfonyl)amide salt including RE used components.

With both nickel and cobalt featuring heavily in modern industry, there is an ongoing and intense interest in ore supplies and processing, applications development, and recycling. This book presents a collection of authoritative papers covering the latest advances in all aspects of nickel and cobalt processing, including fundamentals, technology, operating practices, and related areas of Platinum-Group Metals (PGM) processing. Special emphasis is given to the treatment of sulphide and laterite ores, concentrates, and secondary materials for the production of nickel and cobalt.

This book is a printed edition of the Special Issue "Hydrometallurgy" that was published in Metals

There is considerable interest in pure and applied studies of extremophilic microorganisms, including those (acidophiles) that are active in low pH environments. As elsewhere in microbiology, this is a fast-developing field, and the proposed special issue of Frontiers highlights many of the more recent advances that have been made in this area. Authors from leading scientific groups located in North and South America, Australasia and Europe have contributed to this e-book, and the topics covered include advances in molecular, biochemical, biogeochemical and industrial aspects of acidophile microbiology.

Physical Chemistry of Metallurgical Processes

Rare-Earth Metal Recovery for Green Technologies

Fundamentals and Applications in New Materials

Membrane-Based Separations in Metallurgy

Hydrometallurgical Process for Producing Lead and Elemental Sulfur from Galena Concentrates

The growth and development witnessed today in modern science, engineering, and technology owes a heavy debt to the rare, refractory, and reactive metals group, of which niobium is a member. Extractive Metallurgy of Niobium presents a vivid account of the metal through its comprehensive discussions of properties and applications, resources and resource processing, chemical processing and compound preparation, metal extraction, and refining and consolidation. Typical flow sheets adopted in some leading niobium-producing countries for the beneficiation of various niobium sources are presented, and various chemical processes for producing pure forms of niobium intermediates such as chloride, fluoride, and oxide are discussed. The book also explains how to liberate the metal from its intermediates and describes the physico-chemical principles involved. It is an excellent reference for chemical metallurgists, hydrometallurgists, extraction and process metallurgists, and minerals processors. It is also valuable to a wide variety of scientists, engineers, technologists, and students interested in the topic.

Hydroxoximes and Copper Hydrometallurgy provides a current examination of what is known regarding hydroxoxime extractants, the chemistry and physicochemistry of extraction, and the potential of applying hydroxoximes for extraction of copper and other metals in industrial processes. Topics addressed include the development of the hydrometallurgical process, methods of synthesis and structural characteristics, extraction properties, losses of active substances and problems associated with environmental pollution, the potential of metal extraction and separation with hydroxoximes, methods of extraction and stripping that can improve metal separation and recovery, the applications of hydroxoximes in various membrane processes, and industrial processes and equipment used for processing oxide ores and tailing. The book will benefit metallurgists, hydrometallurgists, analytical and physical chemists, and researchers in mining industries and solvent extraction.

Hydrometallurgy Fundamentals and Applications

Numerical simulation of multiphase reactors with continuous liquid phase provides current research and findings in multiphase problems, which will assist researchers and engineers to advance this field. This is an ideal reference book for readers who are interested in design and scale-up of multiphase reactors and crystallizers, and using mathematical model and numerical simulation as tools. Yang and Mao's book focuses on modeling and numerical applications directly in the chemical, petrochemical, and hydrometallurgical industries, rather than theories of multiphase flow. The content will help you to solve reacting flow problems and/or system design/optimization problems. The fundamentals and principles of flow and mass transfer in multiphase reactors with continuous liquid phase are covered, which will aid the reader's understanding of multiphase reaction engineering. Provides practical applications for using multiphase stirred tanks, reactors, and microreactors, with detailed explanation of investigation methods. Presents the most recent research efforts in this highly active field on multiphase reactors and crystallizers. Covers mathematical models, numerical methods and experimental techniques for multiphase flow and mass transfer in reactors and crystallizers.

Principles of Mineral Processing

Resources, Extraction, Batteries, and Recycling

Waste Electrical and Electronic Equipment Recycling

The Chemistry of Gold Extraction

Numerical Simulation of Multiphase Reactors with Continuous Liquid Phase

Membrane-Based Separation in Metallurgy: Principles and Applications begins with basic coverage of the basic principles of the topic and then explains how membrane technology helps in the development of new environmentally friendly and sustainable metallurgical processes. The book features the principles of metallurgical process and how widely the membrane-based technology has been applied in metallurgical industry, including the basic principles of membrane-based separation in terms of material science, membrane structure engineering, transport mec process flowcharts with emphasis on membrane separations, current process designs, and describes problems and provides possible solutions. In addition, the book includes specific membrane applications, molecular design of materials, fine tuning of membrane's multi-scale structure, module selection and process design, along with a final analysis of the environmental and economic benefits achieved by using these new processes. Outlines membrane separation processes and their use in the field of metallurgy Includes case studies and examples of various pro sectors of extractive metallurgy in a clear and thorough presentation for students and engineers Provides a quick reference to wastewater treatment using membrane technology in the metallurgical industry Outlines the design of flowsheets, a topic that is not covered in academic studies, but is necessary for the design of working process Provides examples and analysis of the economic implications and environmental and social impacts This revised, new edition retains its class-tested coverage of how metals behave in water while updating and expanding information about metals processing methods. The book further retains its emphasis on predicting and engineering the way metals are extracted from ore sources, separated from unwanted entities, recovered as metals, and purified using water based processing. The transformation of minerals to metals requires hydrometallurgical processing for nearly all of the nonferrous metals we use. This book elucidates the associated fundamentals a assess processes and performance. The new edition further includes additional photographs, updated drawings, supplementary data, updated descriptive information, and new detail on rare earth elements processing as well as recycling and byproduct recovery of metals.

This book examines the development, use, extraction, and recovery of rare earth metals. Rare earth elements (REEs) occupy a key role in daily life in industrial applications. They are one of the critical elements for energy and sustainable growth. REEs are utilized in many modern electrical and electronic devices such as smart phones, computers, LED lights etc. Recovery of the REEs from secondary resources represents a way to meet the growing demand for electronic devices. Because of their rarity, utility, and importance, the recovery, utilization and recycling of metal presents both current methods of processing rare earths from primary and secondary sources and new, green routes for their isolation and purification. The book also addresses their utilization, re-use, reduction, and recycling policies that exist globally. Applications in metallurgy, magnets, ceramics, electronics, and chemical, optical, and nuclear technologies are discussed.

A complete and up-to-date presentation of the fundamental theoretical principles and many applications of solvent extraction, this enhanced Solvent Extraction Principles and Practice, Second Edition includes new coverage of the recent developments in solvent extraction processes, the use of solvent extraction in analytical applications and nuclea re

Aqueous Recovery Methods

Solvent Extraction

Solvent Extraction Principles and Practice, Revised and Expanded

Extractive Metallurgy of Niobium

Theory

Annotation Comprehensive reference examines all aspects of mineral processing from the handling of raw materials to separation strategies to the remediation of waste products. Shows how developments in engr., chemistry, computer science, and environmental science contribute to the ultimate goal of producing minerals and metals economically from ores.

The development of new technologies and the increasing demand for mineral resources from emerging countries are responsible for significant tensions in the pricing of non-ferrous metals. Some metals have become strategic and critical because they are used in many technological applications such as flat panel TVs (indium), solar panel cells (indium), lithium-ion batteries for electric vehicles (lithium, cobalt), magnets (rare earth elements, such as neodymium and dysprosium), scintillators (rare earths), and aviation and medical applications (titanium); their availabilities remain limited. The secured supply of these metals is crucial to continue producing and exporting these technologies, and because the specific properties of these metals form their essential and difficult to substitute for a given industrial application.

Hydrometallurgy have the advantages of being able to process low-grade ores, to allow better control of co-products, and have a lower environmental impact providing that the hydrometallurgical route is optimized and cheap. The need to develop sustainable, efficient, and cheap processes to extract metals from complex and poor polymetallic matrices is real. The aim of this book was to highlight recent advances related to hydrometallurgy to face new challenges in metal production.

This book is concerned with the theoretical principles of hydrometallurgical processes and engineering aspects. The hydrometallurgical processes of production of copper are discussed and leaching of chalcopyrite as the main sulphide mineral of copper processed in industry is used as an example. The book is suitable as a university textbook for students of metallurgy. Examines the different techniques involved

Discusses the production of specific metals using hydrometalluric processes Looks at the future of hydrometallurgy

Mineral Process Chemistry: Resources, Extraction, Batteries and Recycling presents, for the first time, the most recent developments and state-of-the-art of lithium production, lithium-ion batteries, and their recycling. The book provides fundamental and theoretical knowledge on hydrometallurgy and electrochemistry in lithium-ion batteries, including terminology related to these two fields. It is of particular interest to electrochemists who usually have no knowledge in hydrometallurgy and hydrometallurgists not familiar with electrochemistry applied to Li-ion batteries. It is also useful for both teachers and students, presenting an overview on Li production, Li-ion battery technologies, and lithium battery recycling processes that is accompanied by numerous graphical presentations of different battery systems and their electrochemical performances. The book represents the first time that hydrometallurgy and electrochemisrty on lithium-ion batteries are assembled in one unique source. Provides fundamental and theoretical knowledge on hydrometallurgy and electrochemistry in lithium-ion batteries Represents the first time that hydrometallurgy and electrochemistry on lithium-ion batteries are assembled in one unique source. Ideal for both electrochemists who usually have no knowledge in hydrometallurgy and hydrometallurgists not familiar with electrochemistry applied to Li-ion batteries Presents recent developments, as well as challenges in lithium production and lithium-ion battery technologies and their recycling Covers examples of Li processes production with schematics, also including numerous graphical presentations of different battery systems and their electrochemical performances

Parker Centre Hydrometallurgy Conference 2006

Fundamentals and Applications

Solvent Extraction and Liquid Membranes

Fundamentals, Technology, and Innovations

Rate Processes of Extractive Metallurgy

The main challenge in modern solvent extraction separation is that most techniques are mainly empirical, specific and particular for narrow fields of practice and require a large degree of experimentation. This concise and modern book provides a complete overview of both solvent extraction separation techniques and the novel and unified competitive complexation/solvation theory. This novel and unified technique presented in the book provides a key for a preliminary quantitative prediction of suitable extraction systems without experimentation, thus saving researchers time and resources. Analyzes and compares both classical and new competitive models and techniques Offers a novel and unified competitive complexation / solvation theory that permits researchers to standardize some parameters, which decreases the need for experimentation at R&D Presents examples of applications in multiple disciplines such as chemical, biochemical, radiochemical, pharmaceutical and analytical separation Written by an outstanding scientist who is prolific in the field of separation science

This book covers various metallurgical topics, viz. roasting of sulfide minerals, matte smelting, slag, reduction of oxides and reduction smelting, interfacial phenomena, steelmaking, secondary steelmaking, role of halides in extraction of metals, refining, hydrometallurgy and electrometallurgy. Each chapter is illustrated with appropriate examples of applications of the technique in extraction of some common, reactive, rare or refractory metal together with worked out problems explaining the principle of the operation.

The applications of solvent extraction (SX) and liquid membranes (LM) span chemistry, metallurgy, hydrometallurgy, chemical/mineral processing, and waste treatment—making it difficult to find a single resource that encompasses fundamentals as well as advanced applications. Solvent Extraction and Liquid Membranes: Fundamentals and Applications in New Materials draws together a diverse group of internationally recognized experts to highlight key scientific and technological aspects of solvent extraction that are critical to future work in the field. The first chapters identify relevant thermodynamics, kinetics, and interfacial behavior principles and introduce methods for calculating extraction equilibria and kinetic parameters. The next chapters focus on engineering and technological aspects of various industrial processes and plant applications, including optimization and modeling tools and calculations. The final chapters examine new materials for metal extraction and separations, covering preparation and application processes for organic and inorganic sorbents, solid polymeric extractants, and solvent impregnated resins. Solvent Extraction and Liquid Membranes offers a comprehensive review of the most important principles, calculations, and procedures involved in this widely applicable separation technique. The book's pedagogical approach will benefit students and researchers in the field as well as working scientists and engineers who wish to apply solvent extraction to their own applications.

Water Electrical and Electronic Equipment Recycling: Aqueous Recovery Methods provides data regarding the implementation of aqueous methods of processing of WEEEs at the industrial level. Chapters explore points-of-view of worldwide researchers and research project managers with respect to new research developments and how to improve processing technologies. The text is divided into two parts, with the first section addressing the new research regarding the hydrometallurgical procedures adopted from minerals processing technologies. Other sections cover green chemistry, bio-metallurgy applications for WEEE treatment and the current developed aqueous methods at industrial scale. A conclusion summarizes existing research with suggestions for future actions. Provides a one-stop reference for hydrometallurgical processes of metal recovery from WEEE Includes methods presented through intended applications, including waste printed circuit boards, LCD panels, lighting and more Contains suggestions and recommendations for future actions and research prospects

Recent Advances in Acidophile Microbiology: Fundamentals and Applications

A Textbook of Hydrometallurgy

Hydrometallurgical Process Fundamentals

Gold Ore Processing

Fundamentals and Applications of Ion Exchange

Water-based techniques are widely used in minerals processing to separate valuable minerals and ore from less desirable materials. This comprehensive technical reference provides an overview of aqueous metallurgy and its applications in mineral processing operations. The text presents the physicochemical principles of various water-based processes. Written as a text for college- and graduate-level instruction, the book presents the fundamental principles of water-based metallurgy. The author has taught these topics at the college level for more than 30 years, and this book summarizes his lecture notes and vast experience in mineral processing science. It is a valuable reference for those studying mineral processing, resource recovery, and the corrosion of metals and alloys. In addition, it's a practical reference for environmental and chemical engineers, chemists, and mineral processing engineers who are responsible for mineral processing plant design and operations. To enhance learning and provide practical experience, each chapter closes with a series of homework problems based on the various concepts presented. Solutions to the problems, including full explanations, are provided at the back of the book.

A completely revised and up-to-date edition containing comprehensive industrial data. The many significant changes which occurred during the 1980s and 1990s are chronicled. Modern high intensity smelting processes are presented in detail, specifically flash, Contop, Isasmelt, Noranda, Teniente and direct-to-blister smelting. Considerable attention is paid to the control of SO2 emissions and manufacture of H2SO4. Recent developments in electrorefining, particularly stainless steel cathode technology are examined. Leaching, solvent extraction and electrowinning are evaluated together with their impact upon optimizing mineral resource utilization. The volume targets the recycling of copper and copper alloy scrap as an increasingly important source of copper and copper alloys. Copper quality control is also discussed and the book incorporates an important section on extraction economics. Each chapter is followed by a summary of concepts previously described and offers suggested further reading and references.

Guiding readers from the significance, history, and sources of materials to advanced materials and processes, this textbook looks at the production and primary processing of inorganic materials, such as ceramics, metals, silicon, and some composite materials. The text encourages instructors to teach the production of all types of inorganic materials as one. While recognizing the differences between producing various types of materials, the authors focus on the commonality of thermodynamics, kinetics, transport phenomena, phase equilibria and transformation, process engineering, and surface chemistry to all inorganic materials. The text focuses on fundamentals and how fundamentals can be applied to understand how the major inorganic materials are produced and the initial stages of their processing. Understanding of these fundamentals will equip students for engineering future processes for producing materials or for studying the processing of the many less common materials not examined in this text. The text is intended for use in an undergraduate course at the junior or senior level, but will also serve as a useful introductory and reference work for graduate students and practicing scientists and engineers.

The mineral resources of the Industrialized countries, especially the member nations of the North Atlantic Treaty Organiza tion, are being depleted at such a rate that more and more of these count ries are beginning to depend on ore imported from other coun tries. To sustain the economic and strategie well-being of these member countries, it becomes imperative that a program of developing and exploiting other non-conventional mineral resources and a con servation program where metal values from waste dumps and scrap metals and alloys are recycled must be initiated and implemented. In order to meet this challenge, new processes and technology must be available for consideration in the design and operation of the new plants. One of the possible routes of extracting the metals from their ores, especially for multimetal complex ores and very low grade ores, is by hydrometallurgical processing. The hydrometallurgical route of metal recovery where dissolution (leaching), separation and concentration (ion exchange, solvent extraction, and membrane separation) and reduction to metal (cementation, precipitation by gaseous reduction, and electrolysis) is carried out at near ambient temperature is becoming more competi tive with the conventional high temperature processes used in the smelting of metals from high grade and beneficiated ores.

Hydrometallurgy

Classical and Novel Approaches

Ni-Co 2013

Sustainability in the Mineral and Energy Sectors

Advances in Hydrometallurgy

An Introduction to Chemical Metallurgy, Second Edition introduces the reader to chemical metallurgy, including its fundamental principles and some of their applications. References in the text to a date and the author of some law or principle of physical chemistry are given for the sake of historical significance. This book is comprised of eight chapters and opens with an overview of thermodynamics, with particular emphasis on the first law of thermodynamics; the expansion of a gas; thermodynamically reversible changes; applications of thermochemistry in metallurgy; and experimental techniques in calorimetry. The following chapters focus on entropy, free energy, and chemical equilibrium, solutions and reaction kinetics; extraction and refining of metals, including refining by preferential oxidation; and corrosion and electrodeposition. Electrochemistry and interfacial phenomena are also explored, along with surface energy and surface tension, electrolytes and electrolysis, and reduction and oxidation potentials. This monograph is written primarily for chemists and metallurgists as well as students embarking on courses in chemical metallurgy.

Gold Ore Processing: Project Development and Operations, Second Edition, brings together all the technical aspects relevant to modern gold ore processing, offering a practical perspective that is vital to the successful and responsible development, operation, and closure of any gold ore processing operation. This completely updated edition features coverage of established, newly implemented, and emerging technologies; updated case studies; and additional topics, including automated mineralogy and geomaterials, cyanide code compliance, recovery of gold from e-waste, handling of gaseous emissions, mercury and arsenic, emerging non-cyanide leaching systems, hydro-mining, water management, solid-liquid separation, and treatment of challenging ores such as double refractory carbonaceous sulfides. Outlining best practices in gold processing from a variety of perspectives, Gold Ore Processing: Project Development and Operations is a must-have reference for anyone working in the gold industry, including metallurgists, geologists, chemists, mining engineers, and many others. Includes several new chapters presenting established, newly implemented, and emerging technologies in gold ore processing Covers all aspects of gold ore processing, from feasibility and development stages through environmentally responsible operations, to the rehabilitation stage Offers a mineralogy-based approach to gold ore process flowsheet development that has application to multiple ore types

Sustainable practices within the mining and energy sectors are assuming greater significance due to uncertainty and change within the global economy and safety, security, and health concerns. This book examines sustainability issues facing the mining and energy sectors by addressing six major themes: Mining and Mineral Processing; Metallurgy and Recycling; Environment; Energy; Socioeconomic and Regulatory; and Sustainable Materials and Fleets. Emphasizing an integrated transdisciplinary approach, it deliberates on optimizing mining productivity and energy efficiency and discusses integrated waste management practices. It discusses risk management, cost cutting, and integration of sustainable practices for long-term business value. It gives a comprehensive outlook for sustainable mineral futures from academic and industry perspectives covering mine to mill optimization, waste, risk and water management, improved efficiencies in mining tools and equipment, and performance indicators for sustainable developments. It covers how innovation and research underpin management of natural resources including sustainable carbon management. ♦Focuses on mining and mineral processing, metallurgy and recycling, the environment, energy, socioeconomic and regulatory issues, and sustainable materials and fleets. ♦Describes metallurgy and recycling and uses economic, environmental and social parameter analyses to identify areas for improvement in iron, steel, aluminium, lead, zinc, copper, and gold production. ♦Discusses current research on mining, performance indicators for sustainable development, sustainability in mining equipment, risk and safety management, and renewable energy resources ♦Covers alternative and conventional energy sources for the mineral sector as well water treatment and remediation and energy sustainability in mining. ♦Provides an overview of sustainable carbon management. ♦Offers an interdisciplinary approach with international focus.

Hydrometallurgy Theory provides the necessary fundamental background to the multidisciplinary field of hydrometallurgy, presenting the tools needed to utilize the theory to quantitatively describe, model and control the unit operations used in hydrometallurgical plants. The book describes the development and operation of processes utilizing hydrometallurgical operations, making it a valuable resource and reference for researchers, academics, students and industry professionals. It focuses on quantitative problem-solving with many worked examples and focused problems based on Nicol's many years of experience in teaching hydrometallurgy to students, researchers and industry professionals. Helps readers master detailed chemistry and chemical engineering fundamentals that are required to fully engage in the field of hydrometallurgy Provides a ready reference for students, academics and practicing professionals who are confronted by a particular problem or opportunity in hydrometallurgy Features many worked problems and appropriate workshops, providing the necessary skills to tackle quantitative problems in hydrometallurgy

International Series on Materials Science and Technology

Extractive Metallurgy of Copper

The Production and Processing of Inorganic Materials

Fundamentals of Aqueous Metallurgy

**This book provides a college-level overview of chemical processing of metals in water-based solutions, in the field that is known as hydrometallurgy!--*

Mineral processing technologies have been used for decades to protect the environment and many examples of such applications are given here. The book covers four major subject areas: fundamentals; environmental pollution and its prevention; separation processes; and innovative techniques. Audience: Scientists, engineers and technologists conducting both applied and basic research into the different environmental aspects of mineral processing.

Mineral Processing and the Environment

Hydroxoximes and Copper Hydrometallurgy

Project Development and Operations

Materials Processing Fundamentals

Fundamentals and Application of Hydrometallurgy