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Bio mining:

Theory, Microbes and Industrial Processes



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PREFACE

Two excellent books entitled *Biohydrometallurgy* (written by Giovanni Rossi) and *Microbial Mineral Recovery* (edited by Henry Ehrlich and Carole Brierley) were published in 1990 and this book has been written to build on those. During the past decade there has been much renewed interest in biomining. Several new leaching/oxidation processes have been developed and the number of sites at which such processes operate has risen substantially. Relatively low-rate dump or heap leaching processes have been supplemented by processes that employ high-rate stirred tank reactors. In addition, the more traditional dump and heap-leaching processes have been applied to ores and concentrate-coated supports in ways not previously used. The stirred tank reactor-based process built at the Ashanti goldfields (Ghana) almost certainly represents the largest fermenter-based biotechnology process on earth. The size and number of operating bioleaching/oxidation plants and the broadening of application indicates that biomining has become part of the main stream of biotechnology.

This book deals with the theory and application of bioleaching and biooxidation technology and has been written by a combination of people employed in industry and academia. It has been compiled to provide a state-of-the-art description of several industrial bioleaching processes, the theory that underpins those processes and a description of the biology of the microorganisms involved. A major aim of the book is an attempt to provide the interested industrialist and engineer a starting point from which to further investigate bioleaching/biooxidation technology. Presentations of the Gencor process using mesophilic bacteria and the BacTech process using moderate thermophilic bacteria in stirred tank reactors illustrate some of the high-rate technology. Up-to-date applications of heap leaching for copper (e.g., the Quebrada Blanca mine, Chile) and gold (Newmont Gold's Quarry mine, Nevada) extraction, as well as the Geobiotics process for heap leaching concentrate coated support rock are presented to illustrate somewhat lower-rate and less expensive treatment processes.

Biomining technology has been built upon the sustained and outstanding work of a number of individuals of whom there are too many for each to have contributed a chapter to this book. The choice of chapter authors does not reflect the contribution of individual people to this field. Due to space constraints, the book provides a largely applied overview of the subject and no attempt has been made to give an in-depth coverage of engineering, bioleaching chemistry or the molecular biology and biochemistry of leaching microorganisms.

For academics, the writing of book chapters is often viewed as a nuisance because it takes time from writing the journal articles which

are the real “credentials” of scientific scholars. For the industrialists, putting “pen to paper” can be an unwelcome distraction and frustrating to those who are out of practice. I wish to gratefully acknowledge with thanks the sacrifice that the contribution of each of the authors represents. I especially wish to thank Nikki Campbell for redrawing some of the figures in such a professional way. My thanks also to many of the staff at Landes Bioscience for their assistance and particularly to Maureen Jablinske via whom the invitation to produce this book was received and for her help in the early stages.

Douglas E. Rawlings

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