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Book Reviews

MAGNETISM AND MAGNETIC MATERIALS

By J.P. Jakubovics
The Institute of Materials, London, UK, 1994. ix+165 pp, US$40.00

Connection between magnetism and mineral processing is considerable and long–standing. The principles of magnetism have found numerous applications in the processing and beneficiation of minerals although the full potential of the role of magnetic techniques in materials treatment has not been fully explored. One of the reasons for insufficient transfer of the fundamental physical principles of magnetism into the industrial sphere of mineral processing stems from the fact that it is rather difficult to teach desk–bound physicists about engineering so that they could provide meaningful and reliable basis for applications of magnetic techniques in the real–world mineral beneficiation. It thus appears that a more prospective route would be for ore–dressers to learn more about magnetism, the field that still retains its mystique for many of them.

There are numerous textbooks on physical principles of magnetism available on library shelves, most of them either too academic or too specialised to be of immediate use for a plant engineer. The book by J.P. Jakubovics should prove to be of considerable assistance to mineral technologists faced with problems involving magnetism, with no previous acquittance with science.

The book is divided into four chapters: Fundamentals of magnetism, Classification of materials by magnetic properties, Bulk magnetic properties and their measurement, and Magnetic materials for practical applications. The author managed, in 165 pages, to cover, in a simple and lucid way, the fundamental notions of magnetism, i.e. what is a magnetic material, the effect of magnetic field on material, fundamental magnetic properties and classification of magnetic materials based on their basic magnetic properties.

The physics of magnetism is presented in a most readable and, at the same time, exact manner. The section on the measurement of magnetic properties offers the reader an understanding of fundamental techniques that allow to determine the behaviour of a material in a particular application.

The chapter on magnetic materials for practical applications overviews various classes of magnetic materials, including a very useful survey of permanent magnet materials including rare–earth magnets.

There are also six appendices in the book. The first appendix gives a list of symbols and their explanation, and a most useful list of units in SI system. Further two appendices summarise formulae used in the theory of magnetism and brief explanation of vector analysis. The fourth appendix presents twelve worked

examples while the fifth appendix gives thirteen test questions. THe last appendix provides a list of recommended reading.

All told, this is a very good book indeed. It appears to be free of inconsistencies and it offers a comprehensive and dependable coverage of the basic magnetic phenomena without resorting to complicated physics and mathematics. The first–rate text is supported by excellent drawings and photographs.

This slim volume should find its way on the bookshelves of all those who want to learn, in a simple and instructive way, about the fundamentals of magnetism. And for mineral technologists who are involved in magnetic techniques of mineral treatment the textbook should be a compulsory reading.

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COLUMN FLOTATION

By Julius B. Rubinstein
Gordon and Breach Science Publishers, 1995, 312 pp, US$95.00

This book is the second to appear on the subject of column flotation, and the first and similarly named having been published five years ago by J.A. Finch and G.S. Dobby (Pergamon Press, 1990). Julius Rubinstein is currently Professor and Head of the Flotation Equipment and Process Engineering department at the Institute of Solid Fuels Preparation in Moscow. He has more than 25 years of experience in column flotation and took part in the creation of the first commercial column installations in Russia. He has also pioneered the development of the multisectional column and has been closely involved in its successful operation at a number of Russian flotation plants.

The first chapter gives a history of column flotation machines, and also analyses the development of the so–called Canadian flotation column. The second chapter deals with the design of flotation columns, such as different types of columns, the main components of columns, multisectional columns and some novel designs. Chapter 3 is devoted to what many consider to be the heart of the columns, viz the aerator system. Methods of evaluating pneumatic aerators are analysed, together with a description of various types of aerator systems, such as the USBM type of aerator, jet and cyclone type of aerators.

In Chapter 4, experimental methods of investigating the hydrodynamics in the column are described. This includes methods of studying multiphase flow patterns, e.g. the axial dispersion and tank–in–series models, as well as the measurement of aerohydrodynamic characteristics, i.e. mixing and aeration, while Chapter 6 focuses on techniques for pilot–scale column flotation research.

In Chapter 7, the modelling of flotation column kinetics is dealt with in detail by analysing flotation models that describe particle–bubble attachment in the

collection zone. Chapter 8 provides insight into the factors that affect the scale–up of flotation columns, while Chapter 9 covers the very important role of the froth phase, covering froth characteristics, the influence of solids on froth stability, and models of froth transfer processes.

Practical insight into the application of flotation columns in the former Soviet Union is gained in Chapter 10, which also deals with the application of multi–cell and packed columns. The last chapter is dealing with the control of flotation columns, covering level sensors and control algorithms.

This book compares well with the publication of Finch and Dobby, both in terms of the technical content and the quality of presentation. The main advantage of Rubinstein's book is seen in the way in which the theory of column flotation, including models of the collection and froth zones, has been combined with the area of column flotation design and operation experience. A feature of Finch and Dobby's book which is not present in Rubinstein's, however, is a neat summary of each chapter, which makes quick–referencing very easy. Also a criticism which can be levelled at Rubinstein's book is the numerous complex differential and other equations that the average engineer or academic would certainly not even try to comprehend, and as such will be wasted on the greater part of the readers. In contrast, the equations used in Finch and Dobby's book are more user–friendly and application–oriented, and better organised.

This book is bound to be of interest especially to Western mining companies and engineers, as it describes many of the operating practices and types of columns used in the former Soviet Union. Also, many of the substantial list of references cover work that has not previously been published in Western journals. It must also be mentioned that the quality of the print and illustrations, and the general presentation of the book, is of a significantly higher standard than the first volume published by Gordon and Breach (The Physical Separation and Recovery of Metals from Wastes, by Veasy, Wilson and Squires).

In summary, it can be said that Rubinstein's book opens up fresh perspective on column flotation, especially in the field of novel designs and applications, for which the Russian industry is well known. It is written with good attention to detail,and should appeal to the practically–orientated engineer who is looking for new ideas and concepts to introduce to his flotation plant. It would be worth acquiring.

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