Books

User Guide to Segregation
L. Bates, British Materials Handling Board, Cheshire, U.K., 134 pp., £50 ($83.50), 1997

Size/density segregation of particulate solids is a common occurrence in their storage and handling. If segregation occurs, this often can result in severe deleterious effects. For example, if the powder that is fed to a pharmaceutical dosage direct-compression tableting machine is not uniform, the tablets may not be pharmacologically effective. Therefore, knowing what causes segregation and how to prevent it or correct it is very important. The author is a very well-known expert in solids handling in the U.K., and wrote the book under the auspices of the British Materials Handling Board. Although the book is several years old, it is hardly known in the U.S., which is why I am reviewing it now to bring attention to it. The book contains 14 chapters and an extensive bibliography.

Chapter 1 is a brief introduction and overview of the subject. The importance of segregation is discussed in chapter 2, covering prevalence, consequences of segregation, its significance, and how to quantify it. Chapter 3 is a short list of particle properties influencing segregation, while chapter 4 reviews the bulk variables influencing segregation (powder state and dynamics, second-phase effects, and fluid-phase and three-phase effects). The forces that give rise to segregating mechanisms, such as gravity and particle-to-particle contact, are reviewed in chapter 5.

Processes that segregate particles are discussed in chapter 6, primarily those that are caused by particle-to-particle interactions, and those in which the particles are moved under the influence of external forces. Chapter 7 describes a number of regimes in which segregation processes occur (*e.g.,* free fall and trajectory streams, repose flow stream, shearing planes, etc.). Operations that give rise to segregation processes (*e.g.,* storage, handling, conveying and fluidization) are thoroughly discussed in chapter 8. Operational variables (*e.g.,* scale, process rate, equipment form, etc.) and process variables (*e.g.,* temperature, pressure, flowrates and time) that influence segregation are covered in chapters 9 and 10, respectively.
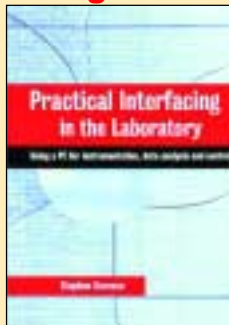
Chapter 11 reviews a number of ambient conditions and ambient variables that influence segregation. Several aspects of the measurement of segregation are discussed in chapter 12 (*e.g.,* number or frequency of samples, significance of sample location, sampling techniques, analysis of the results, etc.). Chapter 13 deals with testing procedures such as sample selection, procurement, preparation, analysis and criteria of acceptance.

Chapter 14 is an excellent review of methods of controlling segregation. Among the topics discussed in good detail are: problem identification and evaluation; minimizing the predisposition of a material to segregate; minimizing the tendency for a material to segregate; and redressing segregation that has taken place. This chapter has a great deal of practical information.

The author has written a most useful book on a phenomenon that occurs frequently in industry and is quite often very vexing. This guide will not answer all questions on this complex subject, but it should provide useful guidance to those concerned with gaining an understanding of particulate solids segregation. It also provides useful techniques for minimizing and mitigating problems arising from segregation. This book will be useful to any chemical engineer involved with particulate solids storage and handling.

Stanley S. Grossel
President, Process Safety & Design
Clifton, NJ

Practical Interfacing in the Laboratory: Using a PC for Instrumentation, Data Analysis, and Control
Stephen E. Derenzo, Cambridge University Press, New York, NY, 610 pp., $65.00, 2003

This text describes, in practical terms, how to use a desktop computer to monitor and control laboratory experiments. The author explains how to design electronic circuits and write computer programs to sense, analyze and display real-world quantities, including displacement, temperature, force, sound, light and biomedical potentials. The book includes numerous laboratory exercises and appendices that provide practical information on microcomputer architecture and interfacing, including complete circuit diagrams and component lists. Topics include analog amplification and signal processing, digital-to-analog and analog-to-digital conversion, electronic sensors and actuators, digital and analog interfacing circuits, programming, and data analysis and control. Only a very basic knowledge of electronics is assumed, making it ideal for college-level laboratory courses and for practicing engineers and scientists.