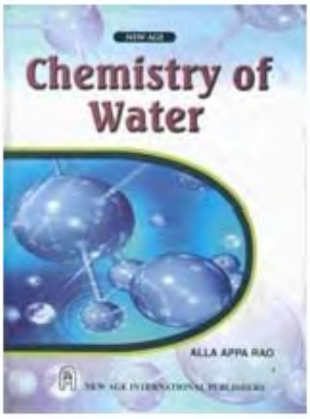


Chemistry of Water. A. A. Rao. New Age International (P) Ltd Publishers, 4835/24, Ansari Road, Daryaganj, New Delhi 110 002. 2008. 408 pp. Price: Rs 495.

Over the past few decades the subject of chemistry of water has evoked major interest among audience in earth sciences, environmental science and oceanography owing to its pivotal role in controlling the chemistry of aquifers and surface water bodies, the fate and the transport of pollutants in the geo-environment and the chemistry of seawater and its sediments. Typically standard books on water/aquatic chemistry catering to the needs of undergraduate and graduate students[1–3] have preliminary chapters dealing with mass conservation, thermodynamics and kinetics and chemical equilibrium calculations. These are typically followed by chapters on acid-base chemistry with generally a focus towards carbonate systems, coordination chemistry, precipitation–dissolution reactions, oxidation–reduction reactions, complexation reactions and reactions on solid surfaces. When I was asked to review this book, I was expecting a book written more or less on similar lines. Furthermore, I was eager to see if the principles of aquatic chemistry were applied to the Indian geo-environmental situation by the author, given the widespread contamination of soils and surface/sub-surface water bodies from geogenic and anthropogenic activities in the country.

Chapter 1 on hydrosphere dealing with hydrological cycle and ecology, and distribution, chapter 5 on water–solutions dealing with acid-base concepts, ion-exchange/adsorption and salt hydrolysis, and chapter 6 on water soluble substances dealing with electrolytes have some bearing with aquatic chemistry principles as conventionally understood. Of the remaining, the chapters on microbiology of drinking water (chapter 4), water pollution (chapter 12), water treatment (chapter 13) and the international hydrological decade (chapter 14) would more aptly fall under the purview of water treatment technology[4,5]. The remaining chapters, heavy water (chapter 7), water as plant constituent (chapter 8), role of water in plant transpiration (chapter 9), effects of water defects (deficit?) in plants (chapter 10) and water transport in plants (chapter 11) would conventionally not be covered in books dealing with aquatic chemistry or water treatment technology.

Chapter 2 on characteristics of natural water has some unusual definitions and classifications. In this chapter, water is classified on the basis of impurities as fresh water, salt water, soft water, clear water, colourless water, opalescing water, turbid water and colour water. Likewise classification of water on the basis of usage fall under potable water, domestic water, technical water, cooling water and medicinal water; that are not encountered normally. The concept and classification of mineral water is equally confounding; water (with the exception of synthetically-produced de-mineralized water) contain some amount of dissolved minerals and depending on the soluble salt concentration, water classifies as fresh water (total dissolved solids (TDS) range from 0 to 1000 mg/l), brackish water (TDS ranges from 1000 to 10,000 mg/l), saline water (10,000 to 100,000 mg/l) and brine water (TDS > 100,000 mg/l)[6]. Typical examples of fresh water are river water, lakes, etc. while, certain groundwater deposits in arid and semi-arid regions of the country with large TDS (>1000 mg/l) would classify as brackish water. The author classifies 'mineral water' into brackish, alkaline, bitter and containing iron salts without qualifying the basis of such a classification. Likewise the same chapter contains a section on the requirements of drinking water. The author gives permissible (allowed) concentrations of contaminants in drinking water without referring to the relevant Bureau of Indian Standard code for drinking water specification[7] and moreover it provides erroneous values for permissible limits of some contaminants in drinking water. The permissible limits of lead, selenium (wrongly spelt; so is strontium) and fluoride is quoted as 0.1, 0.001 and 0.7 mg/l, while the values as per BIS-10500 (ref. 7) for these contaminants are 0.05, 0.01 and 1.5 mg/l respectively.

The concepts of acids and bases, and pH are dealt in the chapter on solution–water (chapter 5). The author defines the fundamental concepts of acid-base theory. He however, does not take forward his discussions to elucidate the role of acid-base chemistry in alkalinity and related concepts, acid-base calculations for natural water and procedures for equilibrium calculations with gas phase, which play an important role in controlling the stability of minerals in the geo-environment. Likewise, chapter 6 does not translate concepts and definitions to applications in aquatic chemistry. The concepts of oxidation–reduction/redox potential and E_h–pH diagrams that are so important in the geo-chemical cycles of elements, speciation of metals at contaminated sites and site-remediation techniques are not dealt with.

The water treatment technology chapters (chapters 4, 12 and 13) dealing with microbiology of water, water pollution and water treatment are more detailed, and discuss fundamentals of aerobic and anaerobic treatment of sewage, types and sources of water pollution, water disinfection techniques, water softening techniques, de-aeration of water and procedures for water analysis that students of environmental science/engineering should find useful. Information about design principles and procedures in the water treatment technology chapters would have added value to them.

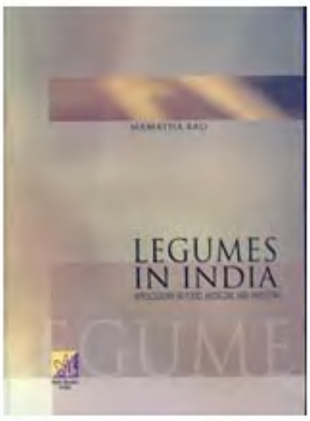
In summary, water treatment technology rather than water chemistry appears to be the strength of this book; the book and its treatment would have immensely benefited had the author solely focused on this subject. Another major lacuna is the absence of bibliography which, if included, would have allowed the reader to consult the source-material referred by the author, and also given an opportunity to the author to acknowledge the sources referred/used by him. A book catering to undergraduate and graduate students must contain sections on worked and practice problems in each chapter that greatly help the student in understanding, theoretical concepts and perform design calculations. Unfortunately, this important section is overlooked by the author. Chemical reactions and mathematical equations have not been numbered in the entire text-book. If the author were to write a second edition to this book, per-

haps he could dwell on issues brought forth in this review.

1. Snoyek, V. L. and Jenkins, D., *Water Chemistry*, John Wiley, New York, 1980.
2. Morel, F. M. and Hering, J. G., *Principles and Applications of Aquatic Chemistry*, John Wiley, New York, 1993.
3. Stumm, W. and Morgan, J. L., *Aquatic chemistry*, Wiley-Interscience, New York, 1995.
4. Metcalf and Eddy Incorporation, *Wastewater Engineering; Treatment and Reuse*, 2003, 4th edn. Revised by George Tchobanoglous, Franklin L. Burton and H. David Stensel, Tata McGraw-Hill, New Delhi, 2003.
5. Gray, N. F., *Water Technology: An Introduction for Environmental Scientists and Engineers*, Elsevier, New York, 2005, 2nd edn.
6. Fetter, C. W., *Applied Hydrogeology*, CBS Publishers and Distributors, New Delhi, 1990.
7. BIS-10500, Indian standard for drinking water-specification. Bureau of Indian Standards, New Delhi, 1991, 2.2 edn.

SUDHAKAR M. RAO

Department of Civil Engineering,
Indian Institute of Science,
Bangalore 560 012, India
e-mail: msrao@civil.iisc.ernet.in



Legumes in India: Applications in Food, Medicine and Industry. Mamatha Rao. Ane Books India, 4821, Parwana Bhawan, 1st Floor, 24 Ansari Road, Darya Ganj, New Delhi 110 002. 2008. 705 pp. Price: Rs 3995.

Legumes are very important group of plants, particularly in the tropics and subtropics. They play a significant role in human nutrition and medicine. Besides, they are of various industrial and other uses, such as sources of tannins, dyes, forarge and fodder, green manures, timber, fibres, beverages and oils.

There are about 179 genera and 11,152 species of legumes recorded from India. The enormous potential of these plants offer in terms of various uses listed above is comprehensively put together by the author. Primarily, the contents of the book are presented in two parts: Part I gives a detailed account of the bioresource potential of legumes in India covering a wide range of topics, viz. economic potential, nutritional significance, anti-nutritional factors, particularly in edible legumes and the presence of chemical constituents which play a major role in the industry. Part II comprises information profiles of 45 species of the Caesalpiniaceae, 198 species of the Fabaceae and 46 species of the Mimosaceae. Various details from valid botanical names to common English names to Indian vernacular names; their geographical and botanical distribution; phytochemistry, edibility and toxicology and so on. Of particular significance are their uses in alternative systems of medicine (*Ayurveda*, *Siddha*, *Unani* and Homoeopathy).

A few observations about the text material which need to be mentioned are as follows: Some of the material is not relevant to the main theme of the book. One example which needs specific mention is: Food right for human blood groups. There are too many tables and also lengthy. One of the tables covers 27 pages. Another table has too much data. The editing is poor, and language, construction of sentences at a number of place leaves much to be desired. Such elaborate details about 'system of nomenclature' are not necessary. The lot of Indian work on various aspects of legume nutrition and biochemistry has escaped the attention of the author.

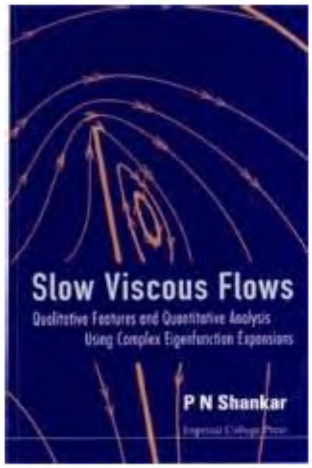
The contents of the book serve three purposes. First, it provides basic information on different aspects of legumes, particularly the various constituents. Secondly, it points out the gaps in knowledge thus laying the foundation for the identification of the areas of study of which provide a vast potential, especially for molecular biologists and biotechnologists to improve nutritional quality of various legumes in view of the presence of anti-nutritional factors and toxicants. This is important as legumes serve as a source of good quality protein not only for human beings but animals as well. Thirdly, of interest is the compilation of medicinal uses of legumes in the alternative systems of medicine. This knowledge will not only be of use to the practitioners in these areas, but also to the pharmaceutical industry, serving as a storehouse to launch studies to identify the principles, verify the claims, work out the bio-safety aspects and conduct clinical studies in order to develop drugs which can alleviate the suffering of human beings.

Overall, the book is an excellent compilation of diverse information. It would be useful to administrators, policy makers and conservationists, besides students, teachers and researchers in botany, environmental and economic botany, biochemistry, pharmaceutical sciences, agricultural sciences and biotechnology.

The author, needs to be congratulated for the excellent job done. In fact, this book clearly points out as to how little work has been done so far and much needs to be done.

YASH P. ABROL

40 SFS, Hauz Khas Apartments,
Sri Aurobindo Marg,
New Delhi 110 016, India
e-mail: ypabrol@vsnl.com



Slow Viscous Flows: Qualitative Features and Quantitative Analysis Using Complex Eigenfunction Expansions. P. N. Shankar. Imperial College Press, 57 Shelter Street, Convert Garden, London WC 2H 9HE, UK. 2007. 563 pp. Price: US$ 58.00.

The title of the book describes, very clearly and concisely its, contents. The subject matter is restricted to viscous flows in the limit of zero Reynolds number,