

ADVANCED CHEMICAL ANALYSIS



Dr. Damodar V. Prabhu
Dr. Sakina Z. Bootwala

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By:

Dr. Damodar V. Prabhu

Former Head and Adjunct Professor Department of Chemistry,
Wilson College Mumbai 400007

Dr. Sakina Z. Bootwala

Adjunct Professor and Former Head Department of Chemistry,
Wilson College Mumbai 400007

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Preface

Experimentation is the cornerstone of Science and is an integral part of Science education. Theory can best be understood if based on experimentation. Ideas and hypotheses have to be tested in the laboratory for validation and acceptance.

This book on **Advanced Chemical Analysis** discusses in detail more than 120 experiments which form a major part of the MSc syllabi of Indian universities and will be particularly useful to students pursuing studies in Analytical and Inorganic Chemistry. The book will also be useful to students pursuing equivalent Chemistry courses in foreign universities. Along with the experimental details, the theoretical background of the experiments has been discussed for a better understanding of the experiment. A step by step approach has been adopted starting with the aim, theory, requirements, detailed procedure and results. Besides a few experiments have been suggested without giving too many experimental details.

The book deals with the analysis of ores, alloys and commercial samples like drugs, detergents, oils, Vitamin C tablets and fertilizers, analysis of foods like honey, fruit juices and milk powder and water. Electroanalytical techniques of analysis like conductometry, potentiometry, pHmetry, colorimetry, spectrophotometry and polarography form an important part of the book. The preparation of inorganic complexes, interpretation of electronic and IR spectra, solvent extraction, Paper Chromatography and Non-aqueous titrations are also discussed in the background of their relevant theory and principles.

The appendices on Safety in the Chemistry laboratory and Preparation of Solutions will be useful to the students as they prepare for the experimental sessions. A bibliography of useful reference books is also included to motivate the readers to do further reading.

The book is based on our long years of teaching and supervising laboratory sessions for MSc classes.

We hope the book will be useful to students, teachers, researchers and industry chemists.

Suggestions for the improvement of the book are welcome.

Dr. Damodar V Prabhu

Dr. Sakina Z Bootwala

Department of Chemistry, Wilson College, Mumbai 400007.

About the Authors



Dr. Damodar V Prabhu is Former Head and Adjunct Professor of Chemistry, Wilson College, Mumbai. He has served as the Dean of the Science Faculty of University of Mumbai and President of the Mumbai Branch of Indian Chemical Society.

His research interests are 1) Reaction Kinetics, 2) Catalysis and 3) Environmental Chemistry. He has guided 9 students for their research degrees, published 66 papers in peer reviewed journals and made 106 presentations in National and International Chemistry Conferences held at Antwerp (Belgium), Bangkok, Hongkong, Kuwait, Zurich (Switzerland), Rome (Italy) and Kuala Lumpur (Malaysia). He has to his credit 5 book chapters published by BP International (UK and India)

He was awarded the Best Paper Presentation Prize at the 6th International Congress of Chemistry and Environment held in 2013 at Antwerp, Belgium.

He has also published 16 papers on Science Education and presented 25 papers on Chemistry Education in National and International conferences.

Dr Prabhu has delivered invited lectures at the Annual Chemistry Conventions of Indian Chemical Society and has been a resource person at UGC (India) sponsored Refresher Courses for college and university teachers.

He has been a member of the DAE appointed National Steering Committee for organizing Science Olympiads in India and was the Delegation Leader of the Indian teams to International Chemistry Olympiads held at Mumbai (2001) and Groningen, Amsterdam, The Netherlands (2002) and Junior Science Olympiads held at Durban, South Africa (2011) and Bali, Indonesia (2016). He was a member of the Academic Committee of the 10th International Junior Science Olympiad hosted by India in 2013 at Pune and Mumbai and International Academic Expert at the 18th IJSO held in Dec. 2021 at Dubai, UAE.

Dr Prabhu has authored 8 ISBN books in Physical and Analytical Chemistry, including a book on Essence of Chemical Kinetics published in August 2022 by SARA Publishers, Ahmedabad. He is the Editor in Chief of GP Globalize Research Journal of Chemistry which is abstracted and indexed in Chemical Abstracts, CAS, USA. He is also the Chief Editor of Green Chemistry and Technology Letters published from Muscat, Oman. He is the Founder General Secretary of Association of Chemistry Teachers (India) and Chairman of Bombay Association for Science Education. He is the Consulting Editor of GPG Journal of Science Education.

Dr Prabhu was elected Fellow of the Royal Society of Chemistry (FRSC) in 2019 and is a member of the American Chemical Society and Affiliate Member of IUPAC.

Awards won-1) Best Chemistry Teacher Award of Chemical Research Society of India in 2006

2) Association of Kineticists of India Award of Indian Chemical Society in 2002

3) Life Time Achievement Award for Teaching of International Science Community Association in 2014.

4) National Science Day Award on February 28, 2022



Dr. Sakina Zoher Bootwala (M.Sc, Ph.D and DHE) is a professor of Chemistry, currently teaching Inorganic Chemistry at Wilson College at post graduate level.. She has been teaching Inorganic Chemistry from 1985 as lecturer and till date as professor. She has delivered over 100 lectures as a resource person at several conferences, workshops and seminars. She is a recipient of the “Best Woman Chemistry Teacher Award” by Association of Chemistry Teachers (India) (2018) and “Best Professor Award” by RULA International (2018). Her main research interests are Coordination and Bioinorganic Chemistry. She has published 25 research articles in national and international journals. She has coauthored 16 text books of Inorganic Chemistry for undergraduate students and has also authored one book for post graduate students

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ABOUT THE AUTHORS



Dr. Damodar V. Prabhu

Former Head and Adjunct Professor Department of Chemistry,
Wilson College Mumbai 400007



Dr. Sakina Z. Bootwala

Adjunct Professor and Former Head Department of Chemistry,
Wilson College Mumbai 400007



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