Dissolution Techniques For Evaluation Of Novel Drug

A practical guide to Quality by Design for pharmaceutical product development Pharmaceutical Quality by Design: A Practical Approach outlines a new and proven approach to pharmaceutical product development which is now being rolled out across the pharmaceutical industry internationally. Written by experts in the field, the text explores the QbD approach to product development. This innovative approach is based on the application of product and process understanding underpinned by a systematic methodology which can enable pharmaceutical companies to ensure that quality is built into the product. Familiarity with Quality by Design is essential for scientists working in the pharmaceutical industry. The authors take a practical approach and put the focus on the industrial aspects of the new QbD approach to pharmaceutical product development and manufacturing. The text covers quality risk management tools and analysis, applications of QbD to analytical methods, regulatory aspects, quality systems and knowledge management. In addition, the book explores the development and manufacture of drug substance and product, design of experiments, the role of excipients, multivariate analysis, and include several examples of applications of QbD in actual practice. This important resource: Covers the essential information about Quality by Design (QbD) that is at the heart of modern pharmaceutical development Puts the focus on the industrial aspects of the new QbD approach Includes several illustrative examples of applications of QbD in practice Offers advanced specialist topics that can be systematically applied to industry Pharmaceutical Quality by Design offers a guide to the principles and application of Quality by Design (QbD), the holistic approach to manufacturing that offers a complete understanding of the manufacturing processes involved, in order to yield consistent and high quality products.

Introduction, Historical Highlights, and the Need for Dissolution Testing Theories of Dissolution Dissolution Testing Devices Automation in Dissolution Testing, by William A. Hanson and Albertha M. Paul Factors That Influence Dissolution Testing Interpretation of Dissolution Rate Data Techniques and of In Vivo Dissolution, by Umesh V. Banakar, Chetan D. Lathia, and John H. Wood Dissolution of Dosage Forms Dissolution of Modified-Release Dosage Forms Dissolution and Bioavailability Dissolution Testing and the Assessment of Bioavailability/Bioequivalence, by Santosh J. Vetticaden Dissolution Rediscovered, by John H. Wood Appendix: USP/NF Dissolution Test.

Fast Dissolving/Disintegrating Dosage Forms (FDDFs) have been commercially available since the late 1990s. FDDFs were initially available as orodispersible tablets, and later, as orodipsersible films for treating specific populations (pediatrics, geriatrics, and psychiatric patients). Granules, pellets and mini tablets are among latest additions to these dosage forms, which are still in the development pipeline. As drug delivery systems, FDDFs enable quicker onset of action, immediate drug delivery, and sometimes offer bioavailability benefits due to buccal/sublingual absorption. With time, FDDF have evolved to deliver drugs in a sustained and controlled manner. Their current market and application is increasing in demands with advances in age adapted dosage forms for different patients and changing regulatory requirements that warrant mandatory assessments of new drugs and drug products

before commercial availability. This book presents detailed information about FDDFs from their inception to recent developments. Readers will learn about the technical details of various FDDF manufacturing methods, formulation aspects, evaluation and methods to conduct clinical studies. The authors also give examples of marketed fast disintegrating/dissolving drug products in US, Europe, Japan, and India. This reference is ideal for pharmacology students at all levels seeking information about this specific form of drug delivery and formulation.

The ultimate goal of drug product development is to design a system that maximizes the therapeutic potential of the drug substance and facilitates its access to patients. Pharmaceutical Dosage Forms: Tablets, Third Edition is a comprehensive resource of the design, formulation, manufacture, and evaluation of the tablet dosage form, an

Master's Thesis from the year 2010 in the subject Medicine - Pharmacology, University of Dhaka (M. Pharm, in Pharmaceutical Technology), language: English, abstract: The aim of the present studies was to develop and characterize 2.6 mg sustained release matrix tablets of Nitroglycerin. Tablets were prepared by direct compression method. Methocel K15M CR and Methocel K100LV CR polymers were used as rate retarding agents in nine formulations (F-1 to F-9). The granules were evaluated for angle of repose, loose bulk density, tapped bulk density, Carr’s index, Hausner ratio, moisture content, total porosity and assay. The tablets were subjected to diameter, thickness, assay, uniformity of content, assay after 1Month at 40°C+75%RH, hardness, friability, and in vitro dissolution studies. The granules showed satisfactory flow properties, compressibility, and drug content. All the tablet formulations showed acceptable pharmacotechnical properties and complied with pharmacopoeial specifications for tested parameters. The in vitro dissolution study was carried out for 8 hour using USP-2009 Apparatus-I (Rotating basket method) in distilled water as the dissolution medium. The release mechanisms were explored and explained by Zero order, First order, Higuchi, Korsmeyer-Peppas and Hixson-Crowell equations. Nine formulations were prepared by using three variable ratio of two polymers; Methocel K15M CR (25%, 20% and 15%) and Methocel K100LV CR (15%, 10% and 5%) where all the formulations (F-1 to F-9) contained 0.5% colloidal silicon dioxide and 1% magnesium stearate. Among these nine formulations, six formulations; F-2 (Methocel K15M CR: Methocel K100LV CR = 25% : 10%), F-3 (Methocel K15M CR : Methocel K100LV CR = 25% : 5%), F-4 (Methocel K15M CR : Methocel K100LV CR = 20% : 15%) F-5 (Methocel K15M CR: Methocel K100LV CR = 20% : 10%), F-6 (Methocel K15M CR : Methocel K100LV CR = 20% : 5%) and F-7 (Methocel K15M CR : Methocel K100LV CR = 15% : 15%) met the official specification of release profile. It was also found that the type and the amount of polymers significantly affect the time required for 50% (T50% or MDT) of drug release, release rate constant and diffusion exponent. Higher the MDT value indicates a higher drug retaining capacity of the polymers and vice-versa. Kinetic modeling of in vitro dissolution profiles revealed the drug release mechanism of all proposed formulations followed anomalous type or non-Fickian transport (n>0.43 and n

Evaluation of Defense Waste Processing Facility (DWPF) Chemical Process Cell (CPC) cycle time identified several opportunities to improve the CPC processing time. The Mechanical Systems & Custom Equipment Development (MS & CED) Section of the Savannah River National Laboratory (SRNL) recently completed the evaluation of one of these opportunities - the possibility of

using an Isolok sampling valve as an alternative to the Hydragard valve for taking DWPF process samples at the Slurry Mix Evaporator (SME). The use of an Isolok for SME sampling has the potential to improve operability, reduce maintenance time, and decrease CPC cycle time. The SME acceptability testing for the Isolok was requested in Task Technical Request (TTR) HLW-DWPF-TTR-2010-0036 and was conducted as outlined in Task Technical and Quality Assurance Plan (TTQAP) SRNLRP-2011-00145. RW-0333P QA requirements applied to the task, and the results from the investigation were documented in SRNL-STI-2011-00693. Measurement of the chemical composition of study samples was a critical component of the SME acceptability testing of the Isolok. A sampling and analytical plan supported the investigation with the analytical plan directing that the study samples be prepared by a cesium carbonate (Cs2CO3) fusion dissolution method and analyzed by Inductively Coupled Plasma - Optical Emission Spectroscopy (ICP-OES). The use of the cesium carbonate preparation method for the Isolok testing provided an opportunity for an additional assessment of this dissolution method, which is being investigated as a potential replacement for the two methods (i.e., sodium peroxide fusion and mixed acid dissolution) that have been used at the DWPF for the analysis of SME samples. Earlier testing of the Cs2CO3 method yielded promising results which led to a TTR from Savannah River Remediation, LLC (SRR) to SRNL for additional support and an associated TTQAP to direct the SRNL efforts. A technical report resulting from this work was issued that recommended that the mixed acid method be replaced by the Cs2CO3 method for the measurement of magnesium (Mg), sodium (Na), and zirconium (Zr) with additional testing of the method by DWPF Laboratory being needed before further implementation of the Cs2CO3 method at that laboratory. While the SME acceptability testing of the Isolok does not address any of the open issues remaining after the publication of the recommendation for the replacement of the mixed acid method by the Cs2CO3 method (since those issues are to be addressed by the DWPF Laboratory), the Cs2CO3 testing associated with the Isolok testing does provide additional insight into the performance of the method as conducted by SRNL. The performance is to be investigated by looking to the composition measurement data generated by the samples of a standard glass, the Analytical Reference Glass - 1 (ARG-1), that were prepared by the Cs2CO3 method and included in the SME acceptability testing of the Isolok. The measurements of these samples were presented as part of the study results, but no statistical analysis of these measurements was conducted as part of those results. It is the purpose of this report to provide that analysis, which was supported using JMP Version 7.0.2.

Probably more than any other element, iron markedly influences the chemical and physical properties of soils and sediments in the earth. Considering its transition metal status, with potential variation in electronic configuration, ionic radius, and magnetic moment, combined with its abundance and relatively large mass, little wonder that one sees its unique influence on every hand. Pre sentations at the NATO Advanced Study Institute (NATO AS!) on Iron in Soils and Clay Minerals reviewed and discussed the occurrence, behavior, and properties of Fe-bearing minerals found in soils and in the clay mineral groups kaolinite, smectite, and mica. Also discussed at the NATO AS! were the basic chemical properties of Fe, methods for separating and identifying Fe in minerals, and the role of Fe minerals in weathering and other soil-forming processes. The present publication is the reviewed and

edited proceedings of that Advanced Study Institute. The sequence of chapters follows the general pattern beginning with introductory chapters which overview the general occurrence of Fe in the earth and its chemistry, both generally and in mineral environments, followed by identification and characterization methods for Fe and Fe phases in minerals. The properties and behavior of Fe oxides, Fe-bearing clay minerals, and other Fe minerals in soils are then described, and the text ends with a summary of the role of Fe in soil-forming processes. A Table of Contents and subject index are provided to assist the reader in finding specific topics within the text.

The Handbook of Pharmaceutical Controlled Release Technology reviews the design, fabrication, methodology, administration, and classifications of various drug delivery systems, including matrices, and membrane controlled reservoir, bioerodible, and pendant chain systems. Contains cutting-edge research on the controlled delivery of biomolecules! Discussing the advantages and limitations of controlled release systems, the Handbook of Pharmaceutical Controlled Release Technology covers oral, transdermal, parenteral, and implantable delivery of drugs discusses modification methods to achieve desired release kinetics highlights constraints of system design for practical clinical application analyzes diffusion equations and mathematical modeling considers environmental acceptance and tissue compatibility of biopolymeric systems for biologically active agents evaluates polymers as drug delivery carriers describes peptide, protein, micro-, and nanoparticulate release systems examines the cost, comfort, disease control, side effects, and patient compliance of numerous delivery systems and devices and more!

The need to validate an analytical or bioanalytical method is encountered by analysts in the pharmaceutical industry on an almost daily basis, because adequately validated methods are a necessity for approvable regulatory filings. What constitutes a validated method, however, is subject to analyst interpretation because there is no universally accepted industry practice for assay validation. This book is intended to serve as a guide to the analyst in terms of the issues and parameters that must be considered in the development and validation of analytical methods. In addition to the critical issues surrounding method validation, this book also deals with other related factors such as method development, data acquisition, automation, cleaning validation and regulatory considerations. The book is divided into three parts. Part One, comprising two chapters, looks at some of the basic concepts of method validation. Chapter 1 discusses the general concept of validation and its role in the process of transferring methods from laboratory to laboratory. Chapter 2 looks at some of the critical parameters included in a validation program and the various statistical treatments given to these parameters. Part Two (Chapters 3, 4 and 5) of the book focuses on the regulatory perspective of analytical validation. Chapter 3 discusses in some detail how validation is treated by various regulatory agencies around the world, including the United States, Canada, the European Community, Australia and Japan. This chapter also discusses the International

Conference on Harmonization (ICH) treatment of assay validation. Chapters 4 and 5 cover the issues and various perspectives of the recent United States vs. Barr Laboratories Inc. case involving the retesting of samples. Part Three (Chapters 6 - 12) covers the development and validation of various analytical components of the pharmaceutical product development process. This part of the book contains specific chapters dedicated to bulk drug substances and finished products, dissolution studies, robotics and automated workstations, biotechnology products, biological samples, analytical methods for cleaning procedures and computer systems and computer-aided validation. Each chapter goes into some detail describing the critical development and related validation considerations for each topic. This book is not intended to be a practical description of the analytical validation process, but more of a guide to the critical parameters and considerations that must be attended to in a pharmaceutical development program. Despite the existence of numerous guidelines including the recent attempts by the ICH to be implemented in 1998, the practical part of assay validation will always remain, to a certain extent, a matter of the personal preference of the analyst or company. Nevertheless, this book brings together the perspectives of several experts having extensive experience in different capacities in the pharmaceutical industry in an attempt to bring some consistency to analytical method development and validation.

Due to a worldwide need for lower cost drug therapy, use of generic and multi-source drug products have been increasing. To meet international patent and trade agreements, the development and sale of these products must conform to national and international laws, and generic products must prove that they are of the same quality and are therapeutically equivalent to the brand name alternative. However, many countries have limited resources to inspect and verify the quality of all drug products for sale in their country. This title discusses the worldwide legislative and regulatory requirements for the registration of generic and multi-source drug products.

This test guideline describes a test procedure to gain information on dispersion stability of manufactured nanomaterials in simulated environmental media. The main purpose of this guideline is to assess the ability of a nanomaterial to attain a colloidal dispersion and to conserve this ...

Experiments were performed with non-radioactive sludge to determine if the room temperature HF-HNO3 dissolution method used in the DWPF on the Slurry Receipt and Adjustment Tank samples will be effective on the Sludge Batch 3 feed that contains Tank 7 sludge. This dissolution method is particularly rapid and convenient and has been used in the DWPF for several years to minimize analytical turnaround times.

Oral Drug Absorption, Second Edition thoroughly examines the special equipment and methods used to test whether drugs are released adequately when administered orally. The contributors discuss methods for accurately establishing

and validating in vitro/in vivo correlations for both MR and IR formulations, as well as alternative approaches for MR an The highly experienced authors here present readers with step-wise, detail-conscious information to develop quality pharmaceuticals. The book is made up of carefully crafted sections introducing key concepts and advances in the areas of dissolution, BA/BE, BCS, IVIC, and product quality. It provides a specific focus on the integration of regulatory considerations and includes case histories highlighting the biopharmaceutics strategies adopted in development of successful drugs.

Dissolution profiles of two commercial products (Motrine and Rufen®) were analyzed and compared at 8 pH levels, ranging from pH 2.0 to pH 8.0. It was demonstrated, as expected, that the rate and extent of ibuprofen dissolution dissolution was pH dependent. In vitro dissolution characteristics of the ibuprofen solid dispersion formulations prepared by freeze-drying method with various proportions of excipients (theobroma oil, lecithin and PEG 20,000) were investigated at 3 pH levels - pH 2.0, 5.4, and 7.2. As the amount of theobroma oil increased from zero to 31%, the dissolution rate and the percent ibuprofen dissolved was decreased. Freeze-dried systems with a combination of lecithin and PEG 20,000 showed a slower dissolution rate and less amount of drug dissolved than the formulation with only PEG 20,000. The optimal ratio of drug to PEG 20,000 was 1:1. Solid dispersions of ibuprofen prepared by the freezedrying method provided the highest dissolution rate and percentage of drug dissolved when compared with the direct melting method, the solvent method or the physical-mixing method. Dissolution characteristics of the ibuprofen freeze-dried formulation (ratio of drug to PEG 20,000 1:1) were unaffected after storage in 98% relative humidity, but commercial formulation dissolution was drastically reduced. Relative bioavailability of ibuprofen solid dispersed tablets were studied in rabbits after a single oral administration of 50 mg ibuprofen preparations. The freeze-dried solid dispersion formulation with ratio of drug to PEG 1:1 exhibited the greatest relative extent of absorption (129.50 +? 27.99% over control). Preparations with PEG 20,000 enhanced the extent of absorption when compared to the formulation of ibuprofen drug powder. There appeared no advantage in formulating ibuprofen in PEG by freeze-drying over the direct melting method. A slower rate of absorption of ibuprofen was obtained when the amount of theobroma oil was increased in the formulation.

There are unique challenges in the formulation, manufacture, analytical chemistry, and regulatory requirements of low-dose drugs. This book provides an overview of this specialized field and combines formulation, analytical, and regulatory aspects of low-dose development into a single reference book. It describes analytical methodologies like dissolution testing, solid state NMR, Raman microscopy, and LC-MS and presents manufacturing techniques such as granulation, compaction, and compression. Complete with case studies and a discussion of regulatory requirements, this is a core reference for pharmaceutical scientists, regulators, and graduate students.

Pharmaceutical product development is a multidisciplinary activity involving extensive efforts in systematic product development and optimization in compliance with regulatory authorities to ensure the quality, efficacy and safety of resulting products.

Pharmaceutical Product Development equips the pharmaceutical formulation scientist with extensive and up-to-date knowledge of drug product development and covers all steps from the beginning of product conception to the final packaged form that enters the market and lifecycle management thereof. Applications of core scientific principles for product development are also thoroughly discussed in conjunction with the latest approaches involving design of experiment and quality by design with comprehensive illustrations based on practical case studies of several dosage forms. The book presents pharmaceutical product development information in an easy-to-read mode with simplified theories, case studies and guidelines for students, academicians and professionals in the pharmaceutical industry. It is an invaluable resource and hands-on guide covering managerial, regulatory and practical aspects of pharmaceutical product lifecycle management.

Dissolution experiments were conducted on radioactive sludge from Tank 7, before transfer of the contents of Tank 7 to Tank 51, and the subsequent sludge in Tank 51 to evaluate the effectiveness of the DWPF Cold Chem Method. The DWPF Cold Chem Method is a room temperature dissolution method (DWPF Cold Chem Method) used in the DWPF on the Slurry Receipt and Adjustment Tank (SRAT) samples in preparation for instrumental analysis. Four types of dissolutions experiments were carried out, the DWPF Cold Chem Method, hot aqua regia, sodium peroxide fusion and hot HF-HNO3. The hot HF-HNO3 digestion is modified version of the DWPF method that incorporates a heating step. The hot aqua regia and sodium peroxide fusion digestions were included as reference digestions. The resulting solutions from all the sludge digestions were analyzed by ICP-ES (Inductively Coupled Plasma Emission Spectroscopy). Visual observations and ICP-ES results were used to evaluate the effectiveness of the DWPF Cold Chem by comparison to the hot aqua regia, sodium peroxide fusion and the hot HF-HNO3 digestions. The data and experimental observations support the following conclusions: The DWPF Cold Chem Method seemed to be effective at dissolving initial species of radioactive sludge, but concurrent precipitation of insoluble mixed-metal fluoride salts was observed in both the Tank 7 and Tank 51 Cold Chem digestion solutions. Complete dissolution, by visual observation, was achieved with a modified hot HF-HNO3 digestion. This was done as an alternative to the DWPF room-temperature acid dissolution.

Developing Solid Oral Dosage Forms is intended for pharmaceutical professionals engaged in research and development of oral dosage forms. It covers essential principles of physical pharmacy, biopharmaceutics and industrial pharmacy as well as various aspects of state-of-the-art techniques and approaches in pharmaceutical sciences and technologies along with examples and/or case studies in product development. The objective of this book is to offer updated (or current) knowledge and skills required for rational oral product design and development. The specific goals are to provide readers with: Basics of modern theories of physical pharmacy, biopharmaceutics and industrial pharmacy and their applications throughout the entire process of research and development of oral dosage forms Tools and approaches of preformulation investigation, formulation/process design, characterization and scale-up in pharmaceutical sciences and technologies New developments, challenges, trends, opportunities, intellectual property issues and regulations in solid product development The first book (ever) that provides comprehensive and in-depth coverage of what's required for developing high quality pharmaceutical products to meet international standards It covers a

broad scope of topics that encompass the entire spectrum of solid dosage form development for the global market, including the most updated science and technologies, practice, applications, regulation, intellectual property protection and new development trends with case studies in every chapter A strong team of more than 50 well-established authors/co-authors of diverse background, knowledge, skills and experience from industry, academia and regulatory agencies

A knowledge of clay is important in many spheres of scientific endeav our, particularly in natural sciences such as geology, mineralogy and soil science, but also in more applied areas like environmental and mater ials science. Over the last two decades research into clay mineralogy has been strongly influenced by the development and application of a num ber of spectroscopic techniques which are now able to yield information about clay materials at a level of detail that previously would have seemed inconceivable. This information relates not only to the precise characterization of the individual clay components themselves, but also to the ways in which these components interact with a whole range of absorbate molecules. At present, however, the fruits of this research are to be found principally in a somewhat widely dispersed form in the scientific journals, and it was thus considered to be an appropriate time to bring together a compilation of these spectroscopic techniques in a way which would make them more accessible to the non-specialist. This is the primary aim of this book. The authors of the various chapters first describe the principles and instrumentation of the individual spectro scopic techniques, assuming a minimum of prior knowledge, and then go on to show how these methods have been usefully applied to clay mineralogy in its broadest context.

Enzymes have interesting applications in our biological system and act as valuable biocatalysts. Their various functions allow enzymes to develop new drugs, detoxifications, and pharmaceutical chemistry. Research Advancements in Pharmaceutical, Nutritional, and Industrial Enzymology provides emerging research on biosynthesis, enzymatic treatments, and bioengineering of medicinal waste. While highlighting issues such as structural implications for drug development and food applications, this publication explores information on various applications of enzymes in pharmaceutical, nutritional, and industrial aspects. This book is a valuable resource for medical professionals, pharmacists, pharmaceutical companies, researchers, academics, and upper-level students seeking current information on developing scientific ideas for new drugs and other enzymatic advancements.

Dosage Form Design Parameters, Volume I, examines the history and current state of the field within the pharmaceutical sciences, presenting key developments. Content includes drug development issues, the scale up of formulations, regulatory issues, intellectual property, solid state properties and polymorphism. Written by experts in the field, this volume in the Advances in Pharmaceutical Product Development and Research series deepens our understanding of dosage form design parameters. Chapters delve into a particular aspect of this fundamental field, covering principles, methodologies and the technologies employed by pharmaceutical scientists. In addition, the book contains a comprehensive examination suitable for researchers and advanced students working in pharmaceuticals, cosmetics, biotechnology and related industries. Examines the history and recent developments in drug dosage forms for pharmaceutical sciences Focuses on physicochemical aspects, prefomulation solid state properties and polymorphism Contains extensive references for further discovery and learning that are appropriate for advanced undergraduates, graduate students and those interested in drug dosage design

An in Vitro Dissolution Method for the Evaluation of an Intramammary Infusion ProductAcid Dissolution Method for the Analysis of Plutonium

in SoilEvaluation of an Interlaboratory Collaborative Test and Comparison with Results of a Fusion Method TestICP-AES Method for Metals in AirEvaluation of Sample Dissolution Procedures Through an Interlaboratory TrialAcid Dissolution Method for the Analysis of Plutonium in SoilEvaluation of an Interlaboratory Collaborative Test and Comparison with Results of a Fusion Method TestICP-AES Method for Metals in AirEvaluation of Sample Dissolution Procedures Through an Interlaboratory TrialPoorly Soluble DrugsDissolution and Drug ReleaseCRC Press

This book is an Up-to-date and authoritative account on physicochemical principles, pharmaceutical and biomedical applications of hydrogels. It consists of eight contributions from different authors highlighting properties and synthesis of hydrogels, their characterization by various instrumental methods of analysis, comprehensive review on stimuli-responsive hydrogels and their diverse applications, and a special section on self-healing hydrogels. Thus, this book will equip academia and industry with adequate basic and applied principles related to hydrogels.

This book represents the invited presentations and some of the posters presented at the conference entitled "In Vitro-In Vivo Relationship (IVIVR) Workshop" held in Sep tember, 1996. The workshop was organized by the IVIVR Cooperative Working Group which has drawn together scientists from a number of organizations and institutions, both academic and industrial. In addition to Elan Corporation, which is a drug delivery com pany specializing in the development of ER (Extended Release) dosage forms, the IVIVR Cooperative Working Group consists of collaborators from the University of Maryland at Baltimore, University College Dublin, Trinity College Dublin, and the University of Not tingham in the UK. The principal collaborators are: Dr. Jackie Butler, Elan Corporation Prof. Owen Corrigan, Trinity College Dublin Dr. lain Cumming, Elan Corporation Dr. John Devane, Elan Corporation Dr. Adrian Dunne, University College Dublin Dr. Stuart Madden, Elan Corporation Dr. Colin Melia, University of Nottingham Mr. Tom O'Hara, Elan Corporation Dr. Deborah Piscitelli, University of Maryland at Baltimore Dr. Araz Raoof, Elan Corporation Mr. Paul Stark, Elan Corporation Dr. David Young, University of Maryland at Baltimore The purpose of the workshop was to discuss new concepts and methods in the devel opment of in vitro-in vivo relationships for ER products. The original idea went back ap proximately 15 months prior to the workshop itself. For some time, the principal collaborators had been working together on various aspects of dosage form development.

This book is the first text to provide a comprehensive assessment of the application of fundamental principles of dissolution and drug release testing to poorly soluble compounds and formulations. Such drug products are, vis-à-vis their physical and chemical properties, inherently incompatible with aqueous dissolution. However, dissolution methods are required for product development and selection, as well as for the fulfillment of regulatory obligations with respect to biopharmaceutical assessment and product quality understanding. The percentage of poorly soluble drugs, defined in classes 2 and 4 of the Biopharmaceutics Classification System (BCS), has significantly increased in the modern pharmaceutical development pipeline. This book provides a thorough exposition of general method development strategies for such drugs, including instrumentation and media selection, the use of compendial and non-compendial techniques in product development, and phase-appropriate approaches to dissolution development. Emerging topics in the field of dissolution are also discussed, including biorelevant and biphasic dissolution, the use on enzymes in dissolution testing, dissolution of suspensions, and drug release of non-oral products. Of particular interest to the industrial pharmaceutical professional, a brief overview of the formulation and solubilization techniques employed in the development of BCS class 2 and 4 drugs to overcome solubility challenges is provided and is complemented by a collection of chapters that survey the approaches and considerations in developing dissolution methodologies for enabling drug delivery technologies, including nanosuspensions, lipid-based formulations, and stabilized amorphous drug formulations.

Drug Delivery Systems examines the current state of the field within pharmaceutical science and concisely explains the history of drug delivery systems, including key developments. The book translates the physicochemical properties of drugs into drug delivery systems administered via various routes, such as oral, parenteral, transdermal and inhalational. Regulatory and product development topics are also explored. Written by experts in the field, this volume in the Advances in Pharmaceutical Product Development and Research series deepens our understanding of drug delivery systems within the pharmaceutical sciences industry and research, as well as in chemical engineering. Each chapter delves into a particular aspect of this fundamental field to cover the principles, methodologies and technologies employed by pharmaceutical scientists. This book provides a comprehensive examination that is suitable for researchers and advanced students working in pharmaceuticals, cosmetics, biotechnologies, and related industries. Provides up-to-date information on how to translate the physicochemical properties of drugs into drug delivery systems Explores how drugs are administered via various routes, such as oral, parenteral, transdermal and inhalational Contains extensive references and further reading for course and self-study
Pharmaceutical Preformulation and Formulation: A Practical Guide from Candidate Drug Selection to Commercial Dosage Form reflects the mounting pressure on pharmaceutical companies to accelerate the new drug development and launch process, as well as the shift from developing small molecules to the growth of biopharmaceuticals. The book meets the need for advanced information for drug preformulation and formulation and addresses the current trends in the continually evolving pharmaceutical industry. Topics include: Candidate drug selection Drug discovery and development Preformulation predictions and drug selections Product design to commercial dosage form Biopharmaceutical support in formulation Development The book is ideal for practitioners working in the pharmaceutical arena—including R&D scientists, technicians, and managers—as well as for undergraduate and postgraduate courses in industrial pharmacy and pharmaceutical technology.
Liquid Waste Organization (LWO) identified aluminum dissolution as a method to mitigate the effect of having about 50% more solids in High Level Waste (HLW) sludge than previously planned. Previous aluminum dissolution performed in a HLW tank in 1982 was performed at approximately 85 C for 5 days, which became the baseline aluminum dissolution process. LWO initiated a project to modify a waste tank to meet these requirements. Subsequent to an alternative evaluation, LWO management identified an opportunity to perform aluminum dissolution on sludge destined for Sludge Batch 5, but within a limited window that would not allow time for any modifications for tank heating. A variation of the baseline process, dubbed Low Temperature Aluminum Dissolution (LTAD), was developed based on the constraint of available energy input in Tank 51 and the window of opportunity, but was not constrained to a minimum extent of dissolution, i.e. dissolve as much aluminum as possible within the time available. This process was intended to operate between 55 and 70 C, but for a significantly longer time than the baseline process. LTAD proceeded in parallel with the baseline project. The preliminary evaluation at the completion of LTAD focused on the material balance and extent of the aluminum dissolved. The range of values of extent of dissolution, 56% to 64%, resulted from the variation in liquid phase sample data available at the time. Additional solid phase data is available from a sample taken after LTAD to refine this

range. This report provides additional detailed evaluation of the LTAD process based on analytical and field data and includes: a summary of the process chronology; a determination of an acceptable blending strategy for the aluminum-laden supernate stored in Tank 11; an update to the determination of aluminum dissolved using more complete sample results; a determination of the effect of LTAD on uranium, plutonium, and other metals; a determination of the rate of heat loss from a quiescent tank; and an evaluation of the aluminum dissolution rate model and actual dissolution rate. LTAD was successfully completed in Tank 51 with minimal waste tank changes. The following general conclusions may be drawn about the LTAD process: (1) Dissolution at about 60 C for 46 days dissolved 64% of the aluminum from the sludge slurry. (2) The aluminum-laden leach solution decanted to Tank 11 can be blended with a wide variety of supernates without risk of precipitating the dissolved aluminum based on thermodynamic chemical equilibrium models. (3) Uranium and plutonium leached into solution without corresponding leaching of iron or metal other than aluminum, but the total mass leached was a small fraction of the total uranium and plutonium in the sludge. (4) The concentration of uranium and plutonium in the leach solution was indistinguishable from other tank farm supernates, thus, the leach solutions can be managed relative to the risk of criticality like any other supernate. (5) A small amount of mercury leached into solution from the sludge causing the liquid phase concentration to increase 6 to 10 fold, which is consistent with the 4 to 14 fold increase observed during the 1982 aluminum dissolution demonstration. (6) Chromium did not dissolve during LTAD. (7) Chloride concentration increased in the liquid phase during LTAD due to chloride contamination in the 50% sodium hydroxide solution. (8) The rate of heat loss from Tank 51 at temperatures above 45 C appeared linear and predictable at 8E+7 cal/hr. (9) The rate of heat transfer from Tank 51 did not follow a simplified bulk heat transfer model. (10) Prediction of the aluminum dissolution rate was prone to error due to a lack of active specific surface area data of sludge particles. (11) The higher than expected dissolution rate during LTAD was likely due to smaller than expected particle sizes of most of the sludge particles. While evaluating the LTAD process, the dissolved salt solution from Tank 41 that was stored and sampled in Tank 49 was determined to be supersaturated relative to aluminum. Supersaturation in Tank 49 is not a risk to LTAD. However, storing and processing of this supernate carries a risk of solids precipitation, primarily in the form of gibbsite or boehmite. Blending with the supernate in Tank 11 neither increases nor decreases this risk. LTAD was initiated as an opportunity to substantially mitigate the planned increase in canister production and DWPF lifecycle after the realization of more sludge solids stored in the HLW tanks. As determined from the preliminary evaluation of LTAD, the direct benefit of the decanted liquid stored in Tank 11 represents 45 canisters at 34% waste loading with potential indirect benefits for much larger reductions. Application of an aluminum dissolution process to the remaining high aluminum content sludge will potentially reduce the planned canister production by several hundred canisters at

34%-38% waste loading.

The first edition of Inductively Coupled Plasma Spectrometry andits Applications was written as a handbook for users who wanted abetter understanding of the theory augmented by a practical insightof how best to approach a range of applications, and to provide auseful starting point for users trying an approach or technique newto them. These objectives have been retained in the second editionbut a slight shift in emphasis gives the volume an overallperspective that is more forward looking. Structured into 11 chapters, the current edition is a thoroughrevision of the original, covering the principles of inductivelycoupled plasmas, instrumentation, methodology and applicationswithin environmental analysis, earth science, food science andclinical medicine. Each chapter, written by internationallyrecognised leaders in their specific subject areas, provides enoughdetail to be useful to both the new and experienced users. Fullaccount is taken of recent developments, such as high resolutioninstruments, novel detection systems and electrospraytechniques. Written for all analytical scientists but particularly thoseinvolved in atomic spectroscopy and in environmental, geochemical,clinical or food analysis, this timely and informative book will bean essential reference in their use of inductively coupled plasmasto achieve their own scientific goals.

Industrial residues are obtained from all treatments of raw materials in industry during the process of mining, raw materials treatment and final usage. During these processes of enrichment, optimization and utilization of raw materials only part of the original material can be used for the dedicated application and some left-over parts remain. This contribution focuses on residues like mining overburdens, ore residues and ore processing residues like slags, but also on incineration ashes and water purification muds. Natural materials like pozzolanes, due to their potential of CO2-reduction, are also included. Based on this knowledge secondary reusable materials due to their chemical, physical and mineralogical properties can be identified. Also different characterization methods for analysing the potential for further application of these residues are included.