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Book reviews

Dielectric Analysis of Pharmaceutical Systems
D.Q.M. Craig, Taylor & Francis, UK, 1995. 232 pages, £65.00 ISBN 0-13-210279-X

As the title indicates, this book presents all the fields of Pharmaceutical Sciences where dielectric spectroscopy has been or could be used. After two chapters dedicated to the principles and methods of measurement in dielectric spectroscopy, the five following chapters are directed to the analysis of pharmaceutical systems, solutions, colloids and suspensions, solids, polymeric systems, and finally to that of biological systems.

The first two chapters could be considered as the first part of this book. They will be of interest to non-specialists in the field of dielectrical analysis (DEA), by clearly presenting the current and potential uses of this technique in Pharmaceutics, but also to specialists who will find there a number of useful references. The first chapter introduces the most fundamental notions of DEA (principles of electricity, response of dielectrics to electric fields, presentation of dielectric functions and type of analysis). The second chapter describes various types of frequency domain measuring techniques and introduces alternative approaches such as time and temperature domains measuring techniques, which are developed in Chapter 6 because of their importance for studying polymer transition phenomena.

Chapter 3 begins the second part of this book by outlining some of the current and potential uses of DEA in the characterisation of aqueous and non-aqueous pharmaceutical solutions. Dielectric analysis is useful in most of the pharmaceutical development steps of a new drug, determinations of the crystalline form, drug stability and reaction rate, relationship between dielectric constant, drug solubility and solubility parameter, estimations of drug-solvent interactions and degree of dissociation. After an introduction on the particular dielectric responses of heterogeneous systems, chapter 4 deals with colloids and suspensions. The use of dielectric spectroscopy is explained for assessing the size and shape of dispersed particles in relatively concentrated systems, for studying micellar structures and shapes, and also the energetics of micelle formation. Several phenomena can be estimated by DEA in these systems, release mechanism of a drug from microcapsules and microspheres, structural information on complex gel systems, effects of processing and formulation variables on the properties and structures of emulsions, microemulsions and liposomes... Very conveniently, and throughout this chapter, the reader interested for further information on a particular dosage form will find useful references for further reading.

The main difficulty with the DEA of solids is its interpretation of the data obtained. Unfortunately, the author does not give answers to this problem but lists the major phenomena detectable by dielectric analysis, identification of different crystal forms and transitions, characterisation of solid compacts and water sorption processes. However, the author also reports interesting quantitative relationships between DEA data and porosity or 50% dissolution time. Polymers are dealt with in a specific sixth chapter. After an introduction on the pharmaceutical importance of polymers, the use of DEA to characterize the properties of major classes of polymers is discussed. Dielectric analysis in both temperature and frequency domains (the latest being less studied) gives a good agreement with mechanical relaxation, determines the degree of local mobility of the polar side groups or of the main chains and their effects on glass transition temperature, makes it possible to identify different types of amorphous materials in pure polymers e.g. in cellulose derivatives. The effects of plasticisers and additives on the dielectric response of polymers are also reviewed along with the continuous monitoring of crosslinking processes and the measurement of the glass transition temperature changes.

Chapter 7 deals with the more complex biological systems starting from the dielectric responses of amino-acids to the study of protein conformation and interaction with water or drugs. In biological tissues, DEA can be used to monitor the extra-cellular fluids, the integrity of the cell membrane, the protein content of tissues and the water associated with them. The dielectric responses of cell suspensions and excised tissues are also reviewed. Finally, several potential uses of DEA in pharmacology, bacteriology and oncology are evaluated.

The last chapter gives a general conclusion on the extraordinary versatility of DEA for studying various pharmaceutical systems. In this very clear book, both

young scientists and more experienced professionals will find useful references to go deeper in a particular subject and help them to develop the use of DEA in the pharmaceutical field in both Academia and Industry.

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Encyclopedic Handbook of Biomaterials and Bioengineering
D.L. Wise, D. Trantolo, D.E. Altobelli, M.J. Yaszemski, J.D. Gresser, E.R. Schwartz (Editors), Marcel Dekker, New York; 1995. 3600 pages, ISBN 0-8247-9594-6.3800

This encyclopedic handbook covers most fields, dealing with biomaterials. It is divided into two main parts, each of which are presented as two volumes. Part A treats materials, whereas Part B refers to various applications of biomaterials. More than 100 authors with academic, clinical or industrial backgrounds, contributed to chapters describing their latest research programs. Most chapters contain a brief historical introduction, a material and method description and quote an average of 150 citations. The book is well illustrated with either clinical photographs, histological sections, radiology or microscopy pictures.

Part A covers materials, such as polymers, metals and ceramics, by recalling their physicochemical characteristics, stability and sterilizability as well as biocompatibility. Starting with general surgical principles required for biomaterial implantation and some physiological models useful for the evaluation of implantable devices are also discussed. An interesting guide to materials selection criteria, describing briefly the main properties and potential applications of various biomaterials, is also provided.

A few chapters deal with tissue and host response, either qualitatively or quantitatively. Cell interactions with implanted materials such as the influence of proteins, neutrophils and the immune system are also carefully reviewed.

Biodegradation of polymer devices are explored extensively, with an important chapter on enzymatic degradation and an detailed discussion on biodegradable sutures of more than 100 pages provided by C. Chu.

The advantageous possibility of modifying the materials surface is also treated in this handbook, with detailed presentations of new surface characterization methods, such as photochemical coupling technology, plasma gas discharge and different scanning microscopical techniques.

Polyesters devices, mainly copolymers of poly(glycolic-co-lactic) acid, are reviewed in depth, with complete descriptions of synthesis reactions, physicochemical characterizations and degradation pathways. Polyesters properties, concerning their possible applications in various fields, e.g. microspheres and orthopedics, are also presented in full.

Several chapters are dedicated to collagen, with particular applications in tissue-inducing implants and wound dressings. Other materials such as silicone, hyaluronan, chitin and polyurethanes are discussed only marginally.

Part B considers various applications of biomaterials. This section deals with engineering problems, mainly with general requirements for achieving successful implants in orthopedy. Metallic implants, bone and maxillo-facial restorations as well as joint replacement arthoplasty are carefully reviewed. An interesting description of fiber reinforced poly(ortho ester), biogenic and synthetic apatite and various composite materials is provided, as well as a detailed presentation of metals (e.g. titanium and zirconium alloy) and their bone-interactions. A few chapters also discuss the effects of biomaterials on bone substitution and repair as well as the various factors affecting bone ingrowth.

The rest of the handbook is divided into miscellaneous chapters, covering vascular applications of biomaterials, such as grafts and prostheses, with an particularly interesting chapter on hemocompatibility. The possible surface modification to reduce thrombogenicity and the various problems related to heart valves are briefly reviewed. Ocular application is only barely treated and is reduced for the most part to ophthalmic collagen devices and intraocular lenses.

This handbook ends with a detailed discussion on different materials for dental application, such as ceramics, porcelains, glassy polymers, composites and alloys.

This encyclopedic handbook takes an interesting multidisciplinary approach and is an excellent reference tool. For this reason it can be recommended strongly, even if the bulk of the information concerns mainly polyesters and orthopedy.

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