Introduction To Particle Technology Solutions

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introduction to particle technology a new edition of the indispensable guide to particulates and powders particle technology concerns the formation processing and properties of the particles and powders which make up many of the products that surround us such products range from the cement and aggregate in the built environment to pharmaceuticals and processed foods most of the process industries involve particles either as essential components such as catalysts or as intermediate or final products and minerals such as the rare earths that are generally mined and processed in particulate form particles can have many beneficial uses but they can also cause harm in the environment and through inhalation to the individual in all cases the powder properties particularly particle size are crucially important this well known textbook now in its 3rd edition provides an easily understood introduction to the underlying scientific principles of particle technology together with examples of how these principles can be used in practical design and operation of industrial processes each chapter contains both worked examples and exercises for the student based on feedback from students and users of the earlier editions this revised and expanded text includes

introductory chapters on particles as products and on computational methods the topics have been selected to give coverage of the broad areas of particle technology and include characterization size analysis surface area processing granulation fluidization particle formation granulation crystallisation tableting size reduction storage and transport hopper design pneumatic conveying standpipes separation filtration settling cyclones safety fire and explosion hazards health hazards engineering the properties of particulate systems to achieve desired product performance discrete element modelling of particulate systems introduction to particle technology 3rd edition is essential reading for students of chemical engineering the text is also recommended reading for students of mechanical engineering applied chemistry pharmaceutics physics mineral processing and metallurgy and is an excellent source for practising engineers and scientists looking to establish a working knowledge of the subject

particle technology is a term used to refer to the science and technology related to the handling and processing of particles and powders the production of particulate materials with controlled properties tailored to subsequent processing and applications is of major interest to a wide range of industries including chemical and process food pharmaceuticals minerals and metals companies and the handling of particles in gas and liquid solutions is a key technological step in chemical engineering this textbook provides an excellent introduction to particle technology with worked examples and exercises based on feedback from students and practitioners worldwide it has been newly edited and contains new chapters on slurry transport colloids and fine particles size enlargement and the health effects of fine powders topics covered include characterization size analysis processing granulation fluidization particle formation granulation size reduction storage and transport hopper design pneumatic conveying standpipes slurry flow separation filtration settling cyclones safety fire and explosion hazards health hazards engineering the properties of particulate systems colloids respirable drugs slurry rheology this book is essential reading for undergraduate students of chemical engineering on particle technology courses it is also valuable supplementary reading for students in other branches of engineering applied chemistry physics pharmaceutics mineral processing and metallurgy practitioners in industries in which powders are handled and processed may find it a useful starting point for gaining an understanding of the behavior of particles and powders review of the first edition taken from high temperatures high pressures 1999 31 243 251 this is a modern textbook that presents clear cut knowledge it can be successfully used both for teaching particle technology at universities and for individual study of engineering problems in powder processing

particle technology and engineering presents the basic knowledge and fundamental concepts that are needed by engineers dealing with particles and powders the book provides a comprehensive reference and introduction to the topic ranging from single particle characterization to bulk powder properties from particle particle interaction to particle fluid interaction from fundamental mechanics to advanced computational mechanics for particle and powder systems the content focuses on fundamental concepts mechanistic analysis and computational approaches the first six chapters present basic information on properties of single particles and powder systems and their characterisation covering the fundamental characteristics of bulk solids powders and building an understanding of density surface area porosity and flow as well as particle fluid interactions gas solid and liquid solid systems with applications in fluidization and pneumatic conveying the last four chapters have an emphasis on the mechanics of particle and powder systems including the mechanical behaviour of powder systems during storage and flow contact mechanics of particles discrete element

methods for modelling particle systems and finite element methods for analysing powder systems this thorough guide is beneficial to undergraduates in chemical and other types of engineering to chemical and process engineers in industry and early stage researchers it also provides a reference to experienced researchers on mathematical and mechanistic analysis of particulate systems and on advanced computational methods provides a simple introduction to core topics in particle technology characterisation of particles and powders interaction between particles gases and liquids and some useful examples of gas solid and liquid solid systems introduces the principles and applications of two useful computational approaches discrete element modelling and finite element modelling enables engineers to build their knowledge and skills and to enhance their mechanistic understanding of particulate systems

particle technology and applications presents the theoretical and technological background of particle science and explores up to date applications of particle technologies in the chemical petrochemical energy mechanical and materials industries it looks at the importance of particle science and technology in the development of efficient chemical processes and novel functional materials with peer reviewed chapters written by a select group of academic and industry experts the book provides examples of particle technology and its advanced industrial applications it includes the necessary scientific background of particle technology as well as relevant technological details of the application areas this helps readers grasp specific details of the applied technology since the advanced particle technology can directly or synergistically have an impact on outcomes such as the development of a targeted functional material enhancement of existing processing techniques and modification of the properties of existing materials presenting a consistent scientific treatment of all topics this comprehensive yet accessible book covers a variety of practical applications and relevant theoretical foundation of particle science and technology it will help readers tackle new challenges in process and product development and create new methodologies in the clean technology sector

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fundamentals of particle technology is designed to assist the understanding of how particulate materials behave during processing and is written with engineers and scientists who are new to the subject in mind it is accessible in both cost and style and is illustrated with numerous line diagrams most of the 16 chapters end with questions in multiple choice format this helps problem decomposition and the reader can see each step required to arrive at an overall process solution if the reader makes a mistake with any of the steps he or she usually does not see their answer and will immediately know where they have gone wrong the aspects of particle technology covered include particle characterisation solid liquid and solid gas separations fluidisation flow of and in dispersions powder mixing storage hazards crushing and colloidal interaction extensive internet support and referencing is provided the teaching style adopted is the result of experience gained from presenting the subject for over 30 years at both undergraduate and postgraduate level

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functionalization of material systems is one of the key developments nowadays in the textile industry where particles are frequently used to enhance the properties of fibers and to add new functionalities this book focuses on innovative textile materials and is a perfect guide for professionals in the textile industry and scientists alike an overview of particle technology is provided before addressing all topics relevant to particle enhanced textiles i e the properties and application of micro nanoparticles in textiles production techniques safety as well as regulatory and intellectual property aspects the book covers the composition and applications of various types of textile fillers finishings and microfibers gives an outlook on

future trends and challenges in the research development and production of nano and micro enabled textiles the authors of the book who are leading experts in their fields address many aspects relevant to the use of particle enhanced textiles in industrial applications as well as in our daily life a particular emphasis is put on practical examples of applications and products safety and sustainability issues and the potential for further innovation this book should bring inspiration for textile scientists in using particles for improving textiles and further expanding their possibilities of use

the inspiration for translating this classic text came during a sabbatical year spent at the university of karlsruhe in 1974 under the leadership of the late professor hans rumpf the institut fur mechanische verfahrenstechnik karlsruhe from the early 1960s onwards by extensive research and advanced teaching had promoted the discipline of mechanical process technology a branch of process engineering which had been rather neglected especially in many chemical engineering depart ments of universities in the english speaking world there is a need for texts of this kind particularly for the more specialized teaching that has to be done during the later stages of engineering courses this work which is really a monograph serves as a concise and compact introduction albeit at an advanced level to all those functions of process engineering that have to do with the handling and treatment of particulate matter and bulk solids much of this information has previously been scattered around journals and other books and not brought together in one work furthermore rumpf has emphasized the physical and theoretical foundations of the subject and avoided a treatment that is simply empirical

if a substance is repeatedly subdivided the result is what are known as microscopic particles these particles are distinguished from the solid mass which they originally formed by the size of the surface area per unit weight this simple difference holds true down to a certain lower size limit and when this limit is exceeded a new state of matter is reached in which the behavior of the particles is quite different to that of the original solid particles in this state are termed superfine particles and are distinct from ordinary particles the size of the superfine particles that is to say the size limit below which particle behavior is completely different from the behavior of the original solid varies a good deal depending on the physical properties of the substance in question properties such as magnetism and electrical resistance are closely related to the internal structural properties of the particles themselves such as the magnetization processes of their respective magnetic domains and the mean free path of charged bodies this internal structure therefore limits the size of the superfine particles in ceramic processing on the other hand the surface area of the particles themselves becomes an even more important factor than their internal structure in this case the size of the superfine particles is determined by the interaction between water and solvents on the surface of the particles

this book contains a selection of high quality papers discussing the state of the art research in particle science and technology presented at the uk china international particle technology forum iv held at shanghai china in december 2013 cover

the branch of science which deals with the handling and processing of particles and powders is termed as particle technology it deals with the production modification handling and usage of a broad range of particulate materials these particles can be wet or dry as well as vary in size from nanometers to centimeters some of the major areas of study associated with particle technology are the behavior of solids in bulk separation of particles through the processes such as tabling magnetic separation and sieving and particle size analysis it is also closely

related to the field of mineral processing and petrochemical industry this book unfolds the innovative aspects of particle technology which will be crucial for the progress of this field in the future also included herein is a detailed explanation of the various concepts and applications of this field this book will also provide interesting topics for research which interested readers can take up

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