

## Sintesis Dan Karakterisasi Membran Komposit Kitosan

Buku ini merupakan hasil Penelitian Dasar Unggulan Perguruan Tinggi Tahun 2019-2020 dari DRPM dan Penelitian Produk Terapan Unimed Tahun 2021. Buku ini menjelaskan proses pembuatan batu kapur menjadi hidroksiapatit. Batu kapur diambil dari Kabupaten Tapanuli Utara. Metode yang digunakan adalah metode ball mill dan presipitasi untuk menghasilkan hidroksiapatit dalam ukuran nanopartikel. Hasil serbuk ini dikarakterisasi dengan FTIR, XRD, SEM-EDS. Hidroksiapatit diperoleh ukuran 66,05 nm dengan struktur hexagonal dan perbandingan Ca/P adalah 1,25. Hasil hidroksiapatit digunakan sebagai campuran pada polivinyl alkohol untuk membuat membrane nanokomposit PVA-kitosan/hidroksiapatit, kemudian dikarakterisasi dengan SEM, uji mekanik dengan UTM, uji termal dengan TGA dan DSC. Hidroksiapatit digunakan sebagai bahan graft tulang melalui uji sitotoksitas MTT dan uji aktivitas antibakteri. Diperoleh hasil bahwa hidroksiapatit dapat digunakan sebagai graft tulang karena tidak toksik, apalagi dicampur dengan 5% Ag aktivitas antibakteri dan viabilitas selnya semakin baik. Buku ini sangat cocok untuk menambah wawasan dan sebagai referensi dalam melaksanakan penelitian.

This book deals with an analysis of materials issues, status of technologies and potential applications of direct methanol fuel cells. The principle of operation of direct methanol fuel cells and the status of knowledge in the basic research areas are presented. The technology of direct methanol fuel cells is discussed in this book with particular regard to fabrication methodologies for the manufacturing of catalysts, electrolytes membrane-electrode assemblies, stack hardware and system design. Membrane Contactors: Fundamentals, Applications and Potentialities, Volume 11 covers new operations that could be efficiently used to improve the performance of a variety of industrial production cycles in applications ranging from biotechnology to agrofood. This book focuses on the basic "principles of work": required membrane materials and properties; major operating parameters; the importance of module configuration and design and; the performance of membrane contactors in specific processes. The authors' dynamic approach to this subject makes Membrane Contactors: Fundamentals, Applications and Potentialities, Volume 11 the most comprehensive book currently available on all aspects related to the 'membrane contactor world. \* Describes new unit operations in process engineering \* Covers a wide variety of industrial applications, from biotechnology to agrofood \* Applicable to process intensification and sustainable growth strategies

This text focuses on the synthesis, properties and applications of nanostructures and nanomaterials, particularly inorganic nanomaterials. It provides coverage of the fundamentals and processing techniques with regard to synthesis, properties, characterization and applications of nanostructures and nanomaterials.

"Interesting with many useful ideas and references. It covers a broad range and it is a good introduction to this field." ---Analyst

Renowned international academicians and food industry professionals have collaborated to create Food Processing: Principles and Applications. This practical, fully illustrated resource examines the principles of food processing and demonstrates their application by describing the stages and operations for manufacturing different categories of basic food products. Ideal as an undergraduate text, Food Processing

stands apart in three ways: The expertise of the contributing authors is unparalleled among food processing texts today. The text is written mostly by non-engineers for other non-engineers and is therefore user-friendly and easy to read. It is one of the rare texts to use commodity manufacturing to illustrate the principles of food processing. As a hands-on guide to the essential processing principles and their application, this book serves as a relevant primary or supplemental text for students of food science and as a valuable tool for food industry professionals.

Each new headline about American students' poor performance in math and science leads to new calls for reform in teaching. Education Teachers of Science, Mathematics, and Technology puts the whole picture together by synthesizing what we know about the quality of math and science teaching, drawing conclusions about why teacher preparation needs reform, and then outlining recommendations for accomplishing the most important goals before us. As a framework for addressing the task, the book advocates partnerships among school districts, colleges, and universities, with contributions from scientists, mathematicians, teacher educators, and teachers. It then looks carefully at the status of the education reform movement and explores the motives for raising the bar for how well teachers teach and how well students learn. Also examined are important issues in teacher professionalism: what teachers should be taught about their subjects, the utility of in-service education, the challenge of program funding, and the merits of credentialing. Professional Development Schools are reviewed and vignettes presented that describe exemplary teacher development practices.

An engaging approach for anyone beginning a career in networking As the world leader of networking products and services, Cisco products are constantly growing in demand. Yet, few books are aimed at those who are beginning a career in IT--until now. Cisco Networking Essentials provides a solid foundation on the Cisco networking products and services with thorough coverage of fundamental networking concepts. Author Troy McMillan applies his years of classroom instruction to effectively present high-level topics in easy-to-understand terms for beginners. With this indispensable full-color resource, you'll quickly learn the concepts, processes, and skills that are essential to administer Cisco routers and switches. Begins with a clear breakdown of what you can expect to learn in each chapter, followed by a straightforward discussion of concepts on core topics Includes suggested labs and review questions at the conclusion of each chapter, which encourage you to reinforce and measure your understanding of the topics discussed Serves as an ideal starting point for learning Cisco networking products and services If you are interested in a career in IT but have little or no knowledge of networking and are new to Cisco networking products, then this book is for you.

Since the publication of the first edition of this text, ever-increasing coatings research has led to many developments in the field. Updated and completely revised with the latest discoveries, Edible Coatings and Films to Improve Food Quality, Second Edition is a critical resource for all those involved in buying, selling, regulating, developing, or using coatings to improve the quality and safety of foods. Topics discussed in this volume include: The materials used in edible coatings and films The chemical and physical properties of coatings and how the coating or film ingredients affect these properties How coatings and films present barriers to gases and water vapors How

coatings and films can improve appearance, or conversely, result in discoloration and cause other visual defects, as well as how to avoid these problems The use of coatings and films on fresh fruit and vegetables, fresh-cut produce, and processed foods How to apply coatings to various commodities How coatings can function as carriers of useful additives, including color, antioxidants, and flavorings Regulation of coatings and coating ingredients by various governing bodies The information contained in this volume is destined to encourage further advances in this field for food and pharmaceutical products. Aggressive research into these products can help to reduce plastic waste, improve applications, lead to greater efficacy, and make regulatory decisions easier in a global climate—ultimately resulting in economical, heightened quality of food and pharmaceutical products.

This book covers all the basic and applied aspects of crystallization processes based on membrane technology. Synthesis and processing of membrane materials are discussed and reviewed, while mass/heat transport and control are treated in view of the non-reversible thermodynamic principles and statistical thermodynamics.

Engineering process design and crystalline materials products properties, and also the relation to other traditional crystallization formats, are analyzed. Advantages, limitations, and future developments are also included in the content, with special emphasis on new fields of applications like microfluidic configurations, controlled proteins (also membrane proteins) crystallization, organic semiconductors single crystals production, and optical materials.

Nanoparticle is a general challenge for today's technology and the near future observations of science. Nanoparticles cover mostly all types of sciences and manufacturing technologies. The properties of this particle are flying over today scientific barriers and have passed the limitations of conventional sciences. This is the reason why nanoparticles have been evaluated for the use in many fields. InTech publisher and the contributing authors of this book in nanoparticles are all overconfident to invite all scientists to read this new book. The book's potential was held until it was approached by the art of exploring the most advanced research in the field of nano-scale particles, preparation techniques and the way of reaching their destination. 25 reputable chapters were framed in this book and there were alienated into four altered sections; Toxic Nanoparticles, Drug Nanoparticles, Biological Activities and Nano-Technology.

Thickening and gelling agents are invaluable for providing high quality foods with consistent properties, shelf stability and good consumer appeal and acceptance. Modern lifestyles and consumer demands are expected to increase the requirements for these products. Traditionally, starch and gelatin have been used to provide the desired textural properties in foods. Large-scale processing technology places greater demands on the thickeners and gelling agents employed. Modified starches and specific qualities of gelatin are required, together with exudate and seed gums, seaweed extracts and, most recently, microbial polysaccharides, to improve product mouthfeel properties, handling, and stability characteristics. These hydrocolloids have been established as valuable food additives as a result of extensive practical experience with different products. Nevertheless, the last few years have produced much additional research data from sophisticated new analytical methods. Information on the fine structure of these complex molecules has given a tremendous insight into

the three-dimensional conformation of hydro colloids and their behaviour in solution. Critical components within the biopolymer have been identified which provide particular thickening, suspending, stabilising, emulsifying and gelling properties. Contributions for this book have been provided by senior development managers and scientists from the major hydrocolloid suppliers in the US and Europe. The wealth of practical experience within this industry, together with chemical, structural and functional data, has been collated to provide an authoritative and balanced view of the commercially significant thickening and gelling agents in major existing and potential food applications.

Penerbit : Airlangga University Press ISBN: 9786024737467 Buku ini merupakan salah satu bentuk upaya mengelaborasi perkembangan nanoteknologi sekaligus mengenalkan istilah kimia nano yang pertama kali diperkenalkan pada tahun 1990-an. Secara mendasar, buku ini akan bercerita tentang dasar-dasar kimia nano, aspek teoretis dan eksperimental dari kimia nano, pendekatan kimia kuantum pada kimia nano, sifat-sifat yang muncul dari pengaplikasian nanomaterial, jenis-jenis kimia nano, beberapa potensi pengaplikasiannya, peluang perkembangan kimia nano ataupun nanoteknologi pada masa yang akan datang, serta kimia nano bagi bangsa Indonesia. Kajian tentang beberapa hal di atas menunjukkan buku ini sangat komprehensif dan up to date.

With the recent advent of commercial ceramic membranes, inorganic membranes are receiving much attention as unique separators and reactors due to their excellent thermal and chemical stabilities. This volume provides an extensive and integrated survey of the science and technology of inorganic membranes. Various methods for making dense metal and solid electrolyte membranes and porous inorganic membranes with tortuous and nearly straight pores are provided. These inorganic membranes, ranging from ceramics to metals to inorganic polymers, can be characterized by many techniques indicative of their separation performance under idealized as well as application conditions. In addition to many commercial liquid-phase applications, inorganic membranes have been used industrially for gas diffusion and particle filtration and demonstrated for the important high-temperature gas separation and membrane reactor applications. Approximately half of the book is devoted to the subject of inorganic membrane reactors. Useful data in many tables and figures and extensive literature and patent information are given throughout the book for further study. The book is a valuable reference for researchers as well as process engineers who are involved in membrane and separation technology. Chemical engineers, chemists and material scientists should also find the text a comprehensible introduction to the subject.

The chapters in this book are based upon lectures given at the NATO Advanced Study Institute on Synthetic Membranes (June 26-July 8, 1983, Alcabideche, Portugal), which provided an integrated presentation of synthetic membrane science and technology in three broad areas. Currently available membrane formation mechanisms are reviewed, as well as the manner in which synthesis conditions can be controlled to achieve desired membrane structures. Membrane performance in a specific separation process involves complex phenomena, the understanding of which requires a multidisciplinary approach encompassing polymer chemistry, physical chemistry, and chemical engineering. Progress toward a global understanding of membrane phenomena is described in chapters on the principles of membrane transport. The chapters on

membrane processes and applications highlight both established and emerging membrane processes, and elucidate their myriad applications. It is our hope that this book will be an enduring, comprehensive compendium of the state of knowledge in the field of synthetic membranes. We have been encouraged in that hope by numerous expressions of interest in the book, coming from a variety of potential users.

### Hidroksiapatit dari Batu Kapur dan Aplikasi Yayasan Kita Menulis

This comprehensive reference work describes in an instructive manner the combination of different membrane operations such as enzyme membrane reactors (EMR's), microfiltration (MF), ultrafiltration (UF), reverse osmosis (RO), nanofiltration (NF) and osmotic distillation (OD) is studied in order to identify their synergistic effects on the optimization of processes in agro-food productions (fruit juices, wines, milk and vegetable beverages) and wastewater treatments within the process intensification strategy. The introduction to integrated membrane operations is followed by applications in the several industries of the food sector, such as valorization of food processing streams, biocatalytic membrane reactors, and membrane emulsification.

Difraktogram XRD arang tempurung kelapa merupakan difraktogram hasil analisis XRD dari material arang hasil pirolisis tempurung kelapa sampai dengan pemanasan suhu tinggi. Proses pirolisis tempurung kelapa menghasilkan arang tempurung kelapa, asap cair, dan aspal. Pemurnian arang tempurung kelapa dihasilkan arang tempurung kelapa dengan kemurnian tinggi. Pemurnian arang dengan tujuan untuk menghilangkan material pengotor yang ada dalam arang tempurung kelapa. Arang yang dipanaskan pada suhu tinggi diperoleh pola difraktogram XRD sesuai pola difraktogram heksagonal grafit. Buku ini membahas proses konversi tempurung kelapa menjadi arang tempurung kelapa. Perlakuan suhu yang tinggi mengubah sifat fisik dan kimia arang. Analisis XRD merupakan analisis struktur Kristal material arang tempurung kelapa. Penggunaan PVA akan menstimulasi pertumbuhan Kristal komposit arang dari material arang amorf menjadi material karbon dengan struktur semi kristalin. Dengan mempelajari buku ini diharapkan mendapat informasi struktur dari arang tempurung kelapa sampai dengan arang pemanasan suhu tinggi 1500°C.

Provides engineers and technicians with detailed data and information on the characteristics, properties, performance, and uses of all types of electric batteries.

Chemistry of Silica and Zeolite-Based Materials covers a wide range of topics related to silica-based materials from design and synthesis to applications in different fields of science and technology. Since silica is transparent and inert to the light, it is a very attractive host material for constructing artificial photosynthesis systems. As an earth-abundant oxide, silica is an ideal and basic material for application of various oxides, and the science and technology of silica-based materials are fundamentally important for understanding other oxide-based materials.

The book examines nanosolvation and confined molecules in silica hosts, catalysis and photocatalysis, photonics, photosensors, photovoltaics, energy, environmental sciences, drug delivery, and health. Written by a highly experienced and internationally renowned team from around the world, Chemistry of Silica and Zeolite-Based Materials is ideal for chemists, materials scientists, chemical engineers, physicists, biologists, biomedical sciences, environmental scientists, toxicologists, and pharma scientists. --- "The enormous versatility of silica for building a large variety of materials with unique properties has been very well illustrated in this book.... The reader will be exposed to numerous potential applications of these materials – from photocatalytic, optical and electronic applications, to chemical reactivity in confined spaces and biological applications. This book is of clear interest not only to PhD students and postdocs, but also to researchers in this field seeking an understanding of the possible applications of meso and microporous silica-derived materials." - Professor Avelino Corma, Institute of Chemical Technology (ITQ-CSIC) and Polytechnical University of Valencia,

Spain Discusses the most important advances in various fields using silica materials, including nanosolvation and confined molecules in silica hosts, catalysis and photocatalysis, and other topics Written by a global team of experts from a variety of science and technology disciplines Ideal resource for chemists, materials scientists, and chemical engineers working with oxide-based materials

The first edition of "Composite Materials" introduced a new way of looking at composite materials. This second edition expands the book's scope to emphasize application-driven and process-oriented materials development. The approach is vibrant yet functional.

In this essential new volume, Volume 13: Membrane and Desalination Technologies, a panel of expert researchers provide a wealth of information on membrane and desalination technologies. An advanced chemical and environmental engineering textbook as well as a comprehensive reference book, this volume is of high value to advanced graduate and undergraduate students, researchers, scientists, and designers of water and wastewater treatment systems. This is an essential part of the Handbook of Environmental Engineering series, an incredible collection of methodologies that study the effects of pollution and waste in their three basic forms: gas, solid, and liquid. Chapters adopt the series format, employing methods of practical design and calculation illustrated by numerical examples, including pertinent cost data whenever possible, and exploring in great detail the fundamental principles of the field. Volume 13: Membrane and Desalination Technologies is an essential guide for researchers, highlighting the latest developments in principles of membrane technology, membrane systems planning and design, industrial and municipal waste treatments, desalination requirements, wastewater reclamation, biofiltration, and more.

Focuses on the application of membrane technologies in removing toxic metals\metalloids from water. Particular attention is devoted to the removal of arsenic, uranium, and fluoride. These compounds are all existing in the earth's crust at levels between two and five thousands micrograms per kg (parts per million) on average and these compounds can be considered highly toxic to humans, who are exposed to them primarily from air, food and water. In order to comply with the new maximum contaminant level, numerous studies have been undertaken to improve established treatments or to develop novel treatment technologies for removing toxic metals from contaminated surface and groundwater. Among the technologies available, applicable for water treatment, membrane technology has been identified as a promising technology to remove such toxic metals from water. The book describes both pressure driven (traditional processes, such as Nanofiltration, Reverse Osmosis, Ultrafiltration,etc) and more advanced membrane processes (such as forward osmosis, membrane distillation, and membrane bio-reactors) employed in the application of interest. Key aspect of this book is to provide information on both the basics of membrane technologies and on the results depending on the type of technology employed.

Filling the gap for a reference dedicated to the characterization of polymer blends and their micro and nano morphologies, this book provides comprehensive, systematic coverage in a one-stop, two-volume resource for all those working in the field. Leading researchers from industry and academia, as well as from government and private research institutions around the world summarize recent technical advances in chapters devoted to their individual contributions. In so doing, they examine a wide range of modern characterization techniques, from microscopy and spectroscopy to diffraction, thermal analysis, rheology, mechanical measurements and chromatography. These methods are compared with each other to assist in determining the best solution for both fundamental and applied problems, paying attention to the characterization of nanoscale miscibility and interfaces, both in blends involving copolymers and in immiscible blends. The thermodynamics, miscibility, phase separation, morphology and interfaces in polymer blends are also discussed in light of new insights involving the nanoscopic scale. Finally, the authors detail the processing-morphology-property

relationships of polymer blends, as well as the influence of processing on the generation of micro and nano morphologies, and the dependence of these morphologies on the properties of blends. Hot topics such as compatibilization through nanoparticles, miscibility of new biopolymers and nanoscale investigations of interfaces in blends are also addressed. With its application-oriented approach, handpicked selection of topics and expert contributors, this is an outstanding survey for anyone involved in the field of polymer blends for advanced technologies.

This text deals with the effect of processing on the microstructure and properties of advanced structural and electroceramic materials. It fulfils the need for a well illustrated book explaining the relation between microstructure and properties in structural ceramics, featuring high quality micrographs and characterization techniques.

Penggunaan biomaterial sebagai material implan bukanlah hal baru. Secara alami, manusia sudah memiliki insting untuk menggunakan berbagai material untuk menggantikan fungsi jaringan/organ tubuh yang mengalami kerusakan/kegagalan. Tidak hanya untuk menggantikan fungsi jaringan/organ tubuh namun juga memberikan karakteristik biokompatibel. Buku ini memberikan pengantar bagi pembaca dalam memahami biomaterial, mulai dari sejarah perkembangan, berbagai jenis biomaterial, serta berbagai pengujian fisis maupun biokompatibilitas biomaterial.

This Second Edition incorporates new developments in theory, materials, and applications in synthetic polymeric membrane research, emphasizing the membranes themselves and the relationship between structure and function. Evaluates the present status of membrane technology and indicates the direction of future developments. Covers various separation processes, miscellaneous uses of membranes, membrane polymers, polymer solutions, dense membranes, phase-inversion membranes, and more.

Natural/Biofiber composites are emerging as a viable alternative to glass fiber composites, particularly in automotive, packaging, building, and consumer product industries, and becoming one of the fastest growing additives for thermoplastics. Natural Fibers, Biopolymers, and Biocomposites provides a clear understanding of the present state

User-friendly, even for those with limited knowledge of chemistry, it contains clear details of processing, applications, and safety. New to this edition is an appendix covering the considerable progress that has taken place since 1987, including the development of alternatives for chlorofluorocarbons (CFCs) and the advent of polyurea elastomers.

Here is the first book devoted completely to inorganic membrane separations and applications. It provides detailed information on all aspects of the development and utilization of both commercial and developmental inorganic membranes and membrane-based processes, pointing out their key advantages and limitations as separation tools. Characteristics, technological advances, and future applications of inorganic membranes are discussed in depth. An overview of the origins of these membranes provides a basis for understanding emerging technologies in the field. Coverage of thermal, chemical, surface, and mechanical properties of inorganic membranes includes discussion of pore diameter, thickness, and membrane morphology. You'll gain valuable insights into membrane modification, as well as the design and operation of membrane filtration units. Also included are sections on how to analyze mechanisms that affect flux feature models for prediction of micro- and ultrafiltration flux that help you minimize flux decline. Descriptions of cross-flow membrane filtration and common operating configurations clarify the influence of important operating parameters on system performance. Parameters influencing solute retention properties during ultrafiltration are identified and discussed or treated in detail.

This book reports on recent progress in emerging technologies, modern characterization methods, theory and applications of advanced magnetic materials. It covers broad spectrum of topics: technology and characterization of rapidly quenched nanowires for information

technology; fabrication and properties of hexagonal ferrite films for microwave communication; surface reconstruction of magnetite for spintronics; synthesis of multiferroic composites for novel biomedical applications, optimization of electroplated inductors for microelectronic devices; theory of magnetism of Fe-Al alloys; and two advanced analytical approaches for modeling of magnetic materials using Everett integral and the inverse problem approach. This book is addressed to a diverse group of readers with general background in physics or materials science, but it can also benefit specialists in the field of magnetic materials.

This book contains the papers presented at the "First International Symposium on Aerogels (1 ISA)", held in September 1985 at the University of Würzburg, Fed. Rep. of Germany. It was the first meeting of this kind, with participants from several European countries, the United States of America, Canada, South America, and Africa. The meeting was interdisciplinary, with most of the participants being physicists, chemists or material scientists either from universities or from industrial research institutes. Let me try to shed some light upon the class of substances the symposium was about: Aerogels are extremely porous high-tech materials, consisting either of silica, alumina, zirconia, stannic or tungsten oxide or mixtures of these oxides. Due to their high porosity (up to 99%!) and their large inner surface, aerogels serve as especially active catalysts or as catalytic substrates, as adsorbents, fillers, reinforcement agents, pigments and gellifying agents. Silica aerogels as translucent or transparent superinsulating fillers in window systems could help to considerably reduce thermal losses in windows and to improve the energy balance in passive solar systems. Aerogels also have fascinating acoustic properties - the sound velocity can be as low as 100 m/s! The production of aerogels starts with the controlled conversion of a sol into a gel: The growth of clusters or polymer chains from a chemical solution, the cross-linking of these primary entities and the formation of a coherent network - still embedded in a liquid.

Introduces readers to the field of inorganic materials, while emphasizing synthesis and modification techniques Written from the chemist's point of view, this newly updated and completely revised fourth edition of *Synthesis of Inorganic Materials* provides a thorough and pedagogical introduction to the exciting and fast developing field of inorganic materials and features all of the latest developments. New to this edition is a chapter on self-assembly and self-organization, as well as all-new content on: demixing of glasses, non-classical crystallization, precursor chemistry, citrate-gel and Pechini liquid mix methods, ice-templating, and materials with hierarchical porosity. *Synthesis of Inorganic Materials, 4th Edition* features chapters covering: solid-state reactions; formation of solids from the gas phase; formation of solids from solutions and melts; preparation and modification of inorganic polymers; self-assembly and self-organization; templated materials; and nanostructured materials. There is also an extensive glossary to help bridge the gap between chemistry, solid state physics and materials science. In addition, a selection of books and review articles is provided at the end of each chapter as a starting point for more in-depth reading. -Gives the students a thorough overview of the fundamentals and the wide variety of different inorganic materials with applications in research as well as in industry -Every chapter is updated with new content -Includes a completely new chapter covering self-assembly and self-organization -Written by well-known and experienced authors who follow an intuitive and pedagogical approach *Synthesis of Inorganic Materials, 4th Edition* is a valuable resource for advanced undergraduate students as well as masters and graduate students of inorganic chemistry and materials science.

Plasticizers are used to increase the process-ability, flexibility, and durability of the material, and of course to reduce the cost in many cases. This edition covers



introduction and applications of various types of plasticizers including those based on non-toxic and highly effective pyrrolidones, and a new source of Collagen based bio-plasticizers that can be obtained from discarded materials from a natural source; Jumbo Squid (*Dosidicus gigas*). It covers the application of plasticizers in plastic, ion-selective electrode/electrochemical sensor, transdermal drug delivery system, pharmaceutical and environmental sectors. This book can be used as an important reference by graduate students, and researchers, scientists, engineers and industrialists in polymer, electrochemical, pharmaceutical and environmental industries.

From the late-1960's, perfluorosulfonic acid (PFSA)s ionomers have dominated the PEM fuel cell industry as the membrane material of choice. The "gold standard" amongst the many variations that exist today has been, and to a great extent still is, DuPont's Nafion® family of materials. However, there is significant concern in the industry that these materials will not meet the cost, performance, and durability requirements necessary to drive commercialization in key market segments – especially automotive. Indeed, Honda has already put fuel cell vehicles in the hands of real end users that have home-grown fuel cell stack technology incorporating hydrocarbon-based ionomers. "Polymer Membranes in Fuel Cells" takes an in-depth look at the new chemistries and membrane technologies that have been developed over the years to address the concerns associated with the materials currently in use. Unlike the PFSA)s, which were originally developed for the chlor-alkali industry, the more recent hydrocarbon and composite materials have been developed to meet the specific requirements of PEM Fuel Cells. Having said this, most of the work has been based on derivatives of known polymers, such as poly(ether-ether ketones), to ensure that the critical requirement of low cost is met. More aggressive operational requirements have also spurred the development on new materials; for example, the need for operation at higher temperature under low relative humidity has spawned the creation of a plethora of new polymers with potential application in PEM Fuel Cells.

Gunung Sinabung merupakan salah satu gunung berapi aktif yang terdapat di wilayah Indonesia yang terletak di Provinsi Sumatera Utara. Data BNPB menyebutkan diperkirakan sejak gunung Sinabung meletus tahun 2010 hingga saat ini wilayah tersebut menerima ± 250 juta ton abu. Abu vulkanik gunung Sinabung memiliki kandungan kimiawi utama berupa Silika ( $\text{SiO}_2$ ) lebih tinggi bila dibandingkan dengan kandungan abu vulkanik beberapa gunung berapi yang ada di Indonesia .

Berlimpahnya material serta tingginya kandungan silika abu vulkanik Sinabung merupakan suatu hal yang menarik untuk diteliti dan sangat potensial dimanfaatkan sebagai prekursor silika. Silika gel merupakan material yang mempunyai kegunaan secara luas seperti pada industri farmasi, keramik, cat, dan aplikasi khusus pada bidang kimia yakni sebagai bahan penyerap (adsorben). Hal ini didasarkan adanya pori dan keberadaan situs aktif pada permukaannya berfungsi untuk mengikat logam-logam. Buku ini akan membahas tentang material silika abu vulkanik sinabung meliputi karakteristik dan aplikasi. Tinjauan teoritis terkait material silika abu vulkanik gunung sinabung dari berbagai sumber referensi. Penelitian-penelitian yang telah dilakukan terkait material silika berbasis abu vulkanik sinabung meliputi tahapan preparasi/sintesis silika gel dengan berbagai variasi (suhu, metode) untuk mendapatkan kadar yang optimal. Karakterisasi Silika gel menggunakan berbagai instrumentasi (XRF, XRD, FTIR, SEM-EDX, GAS, AAS) dan aplikasinya sebagai

adsorben dalam proses adsorpsi logam-logam.

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