Fluid Catalytic Cracking Fcc In Petroleum Refining

This book, written and edited by leading authorities from academia and industrial groups, covers both preventive- and curative-zeolite-based technologies in the field of chemical processing. The opening chapter presents the state of the art in zeolite science. The two subsequent chapters summarize the chemistries involved in the processes and the constraints imposed on the catalyst/adsorbent. Three major areas are covered: oil refining, petrochemicals and fine chemicals. A chapter on the (curative) use of zeolites in pollution abatement completes this overview. In the area of oil refining, a general lecture sets the scene for present and future challenges. It is followed by in-depth case studies involving FCC, hydrocracking and light naphtha isomerization. Also, an entire chapter is devoted to the often-overlooked subject of base oils. In the area of petrochemicals, the processing of aromatics and olefins is described and special attention is paid to the synergy between catalysis and separation on molecular sieves. Contents:Introduction to Zeolite Science and Technology (M Guisnet & J-P Gilson)The Chemistry of Catalytic Processes (A Corma & A Martínez)Preparation of Zeolite Catalysts (T G Roberie et al.)Refining Processes: Setting the Scene (R H Jensen)Advances in Fluid Catalytic Cracking (E T Habib et al.)Hydrocracking (J A R Van Veen)C4-C6 Alkane Isomerisation (F Schmidt & E Köhler)Base Oil Production and Processing (M Daage)Para-Xylene ManufacturingCatalytic Reactions and Processes (F Alario & M Guisnet)Separation of Paraxylene by Adsorption (A Méthivier)Aromatic Alkylation: Towards Cleaner Processes (J S Beck et al.)Methanol to Olefins (MTO) and Beyond (P Barger)Zeolite Effects on Catalytic Transformations of Fine Chemicals (D E De Vos & P A Jacobs)Functionalization of Aromatics over Zeolite Catalysts (P Marion et al.)Zeolites and 'Non-Zeolite' Molecular Sieves in the Synthesis of Fragrances and Flavors (W F Hoelderich & M C Laufer)Pollution Abatment Using Zeolites: State of the Art and Further Needs (G Delahay & B Coq) Readership: Undergraduates, graduate students, academics and researchers in catalyst chemistry. Reviews:"Chapter authors have provided a teaching text that gives excellent introductory chapters to zeolites, and to the nature and significance of the processes that they can catalyse … This excellent book should be required reading for all scientists who have an interest in improving the environment."Chemistry & Industry

Fluid Catalytic Cracking (FCC) is known to be one of the most profitable processes in oil refineries. However, during FCC, two inevitable and undesirable phenomena occur: coking (which deactivates the catalyst) and resistance to mass transfer.Computational techniques can be employed to simulate the FCC reactor with a view to predicting the optimum operating conditions of the process. Process operation within the optimum conditions increases profitability. A number of mathematical models have been developed for the FCC riser. However, two major set backs were observed in the models. Some of the previous models were

oversimplified as a result of the negligence of mass transfer resistance and the assumption of one dimensional (1D) plug flow. On the other hand, the models were made unwieldy by the use of 3D geometry and the incorporation of large numbers of lumped species. In this book, a 2D model was used to simulate the FCC riser. Mass transfer resistance and coking were considered. This book will be beneficial to oil refineries. It will also make an excellent reference and teaching material for students, lecturers and researchers in Chemical Engineering, Mathematics and Chemistry

Corrosion is a naturally occurring cost, worth billions in the oil and gas sector. New regulations, stiffer penalties for non-compliance and aging assests are all leading companies to develop new technology, procedures and bigger budgets catering to one prevailing method of prevention, cathodic protection. Cathodic Corrosion Protection Systems: A Guide for Oil and Gas industries trains on all the necessary reports, inspection criteria, corrective measures and critical standards needed on various oil and gas equipment, structures, tanks and pipelines. Demands, in the cathodic protection market have driven development for better devices and methods, helping to prolong the equipment and pipeline's life and integrity. Going beyond just looking for leaks, this handbook gives the engineer and manager all the necessary tools needed to put together a safe cathodic protection system, whether it is for buried casing while drilling, offshore structure or submarine pipelines.

A comprehensive review of the theory and practice of the simulation and optimization of the petroleum refining processes Petroleum Refinery Process Modeling offers a thorough review of how to quantitatively model key refinery reaction and fractionation processes. The text introduces the basics of dealing with the thermodynamics and physical property predictions of hydrocarbon components in the context of process modeling. The authors - three experts on the topic - outline the procedures and include the key data required for building reaction and fractionation models with commercial software. The text shows how to filter through the extensive data available at the refinery and using plant data to begin calibrating available models and extend the models to include key fractionation sub-models. It provides a sound and informed basis to understand and exploit plant phenomena to improve yield, consistency, and performance. In addition, the authors offer information on applying models in an overall refinery context through refinery planning based on linear programming. This important resource: -Offers the basic information of thermodynamics and physical property predictions of hydrocarbon components in the context of process modeling -Uses the key concepts of fractionation lumps and physical properties to develop detailed models and workflows for atmospheric (CDU) and vacuum (VDU) distillation units -Discusses modeling FCC, catalytic reforming and hydroprocessing units Written for chemical engineers, process engineers, and engineers for measurement and control, this resource explores the advanced simulation tools and techniques that are available to support experienced and aid

new operators and engineers.

Includes topics not found together in books on petroleum processing: economics, automation, process modeling, online optimization, safety, environmental protection Combines overviews of petroleum composition, refinery processes, process automation, and environmental protection with comprehensive chapters on recent advances in hydroprocessing, FCC, lubricants, hydrogen management Gives diverse perspectives, both geographic and topical, because contributors include experts from eight different countries in North America, Europe and Asia, representing oil companies, universities, catalyst vendors, process licensors, consultants and engineering contractors

A comprehensive reference to the use of innovative catalysts and processes to turn biomass into value-added chemicals Chemical Catalysts for Biomass Upgrading offers detailed descriptions of catalysts and catalytic processes employed in the synthesis of chemicals and fuels from the most abundant and important biomass types. The contributors?noted experts on the topic?focus on the application of catalysts to the pyrolysis of whole biomass and to the upgrading of bio-oils. The authors discuss catalytic approaches to the processing of biomass-derived oxygenates, as exemplified by sugars, via reactions such as reforming, hydrogenation, oxidation, and condensation reactions. Additionally, the book provides an overview of catalysts for lignin valorization via oxidative and reductive methods and considers the conversion of fats and oils to fuels and terminal olefins by means of esterification/transesterification, hydrodeoxygenation, and decarboxylation/decarbonylation processes. The authors also provide an overview of conversion processes based on terpenes and chitin, two emerging feedstocks with a rich chemistry, and summarize some of the emerging trends in the field. This important book: -Provides a comprehensive review of innovative catalysts, catalytic processes, and catalyst design -Offers a guide to one of the most promising ways to find useful alternatives for fossil fuel resources -Includes information on the most abundant and important types of biomass feedstocks -Examines fields such as catalytic cracking, pyrolysis, depolymerization, and many more Written for catalytic chemists, process engineers, environmental chemists, bioengineers, organic chemists, and polymer chemists, Chemical Catalysts for Biomass Upgrading presents deep insights on the most important aspects of biomass upgrading and their various types.

The primary focus of this book as a whole is on performance - performance of the catalyst, of its surface, of the FCC unit, of the feedstocks employed, of the analytical methods used to characterize the catalysts, and of environmentally directed regulations that govern the production of transportation fuels from petroleum. The emphasis on catalyst performance, particularly commercial performance, essentially dictated that the chapter authors be experienced industrial catalytic chemists and engineers. However, each author approached the task with a clear-cut obligation to connect the roots of the science of FCC

catalysis with the technology. Fluid Catalytic Cracking: Science and Technology has been written for workers in industrial catalysis and academia, including graduate students in chemistry or chemical engineering who are interested in acquiring an overall knowledge of one of the world's most important areas of catalysis. The book is concise, each topic is treated briefly; complete, all aspects of FCC catalysis are covered; and clear, anyone involved in this field will find topics of interest.

This practical guide provides information on the design, operation, and troubleshooting of FCC facilities. ...provides practical information covering all areas of fluid catalytic cracking... (Oil & Gas Journal)

Process flow description. FCC Feed Characterization. FCC Catalysts. Chemistry of FCC reactions. Unit monitoring and control. Products and economics. Project management and hardware design. Troubleshooting. Emerging trends in fluidized catalytic cracking. Appendixes: Total correlations. n-d-M correlations. API correlations. ASTM to TBP conversion. Definitions of fluidization terms. Glossary. Index.

Catalysis is literally the heart of many petroleum refining processes and therefore of ongoing interest to those in and around the refining industry. In easy-to-grasp language and format, Petroleum Catalysis in Nontechnical Language examines fluid catalytic cracking (FCC), reforming, hydrotreating, hydrocracking, isomerization, and polymerization, as well as catalysts of the future such as enzymes.

Information necessary to solve scientific or engineering problems is often so vast, that the need arises to lump information together into a more manageable subset in order to proceed. The idea of lumping is one which is used, more or less consciously, in a large variety of fields. The thermodynamics and kinetic behavior of multicomponent mixtures is an area where the requirements of lumping have been clearly identified and the techniques and results of lumping have been analyzed in considerable detail. This book comprises the proceedings of a Symposium on Kinetic and Thermodynamic Lumping of Multicomponent Mixtures which was held at the American Chemical Society Meeting in Atlanta, GA, in April 1991. Papers presented at the symposium consisted of both invited and contributed papers. Each invited paper was a review of a subfield within the landscape of the symposium while the contributed papers contain detailed analyses of specific problems. The symposium brought together active researchers in this field to report on and discuss the progress which has been made in the lumping of mixtures of very many components for a number of different applications, and to identify the important problem areas which still remain. This volume will serve both as an introduction to anyone entering the field, and as a reference work for more experienced researchers.

Discusses the formulation, characterization, microactivity, and pilot-plant testing, and product analysis of fluid cracking catalysts. Examines the use of modern spectroscopic techniques such as infrared spectroscopy, solid-state nuclear

magnetic resonance spectroscopy, and X-ray photoelectron spectroscopy for the analysis of FCC catalysts. Presents the first use of atomic force microscopy in the study of FCC catalysts. Studies the impact of environmental laws on the discovery of novel FCC catalysts.

Provides a comprehensive review on the brand-new development of several multiphase reactor techniques applied in energy-related processes Explains the fundamentals of multiphase reactors as well as the sophisticated applications Helps the reader to understand the key problems and solutions of clean coal conversion techniques Details the emerging processes for novel refining technology, clean coal conversion techniques, low-cost hydrogen productions and CO2 capture and storage Introduces current energy-related processes and links the basic principles of emerging processes to the features of multiphase reactors providing an overview of energy conversion in combination with multiphase reactor engineering Includes case studies of novel reactors to illustrate the special features of these reactors

This book is a printed edition of the Special Issue "Real-Time Optimization" that was published in Processes

The fluid catalytic cracking (FCC) unit is of great importance in petroleum refining industries as it treats heavy fractions from various process units to produce light ends (valuable products). The FCC unit feedstock consists of heavy hydrocarbon with high sulphur contents and the catalyst in use is zeolite impregnated with rare earth metals i.e. lanthanum and cerium oxides. The catalytic cracking reaction is endothermic and takes place at elevated temperature in a fluidised bed reactor generating sulphur-contaminated coke on the catalyst. In the regenerator, coke is completely burnt producing SO2, particulate matter emissions. The impact of the FCC unit is assessed in the immediate neighborhood of the refinery. Emission inventories for years 2008 and 2009 for both SO2 and PM have been calculated based on real operational data. Comprehensive meteorological data for years 2005 - 2009 are obtained and preprocessed to generate planetary boundary layer parameters using Aermet (Aermod preprocessor). Aermod (US EPA approved dispersion model) is applied to predict ground level concentrations of both pollutants in the selected study area. Model output is validated with the corresponding measured values at discrete receptors. The highest hourly SO2 predicted concentrations for both years 2008 and 2009 exceeded the corresponding Kuwait EPA ambient air standard, mainly due to elevated emission rates and the prevailing calm and other meteorological conditions. The highest daily SO2 predicted concentrations also exceeded the Kuwait EPA allowable limit due to high emission rates, while meteorological parameters influence is dampened. Hourly average predicted PM concentrations showed similar variation into SO2 in different location. The daily average predicted PM concentrations are lower than US EPA specified limit. An extensive parametric study has been conducted using three scenarios, stack diameter, stack height and emission rates. It is noticed that stack diameter has no effect on ground level

concentration, as stack exit velocity is a function of the square of stack diameter. With the increase in stack height, the predicted concentrations decrease showing an inverse relation. The influence of the emission rate is linearly related to the computed ground level concentrations SO2 additives are tested for SO2 emissions reduction. In the year 2008, reduction of SO2 annual total emission by 43% results in full compliance with Kuwait EPA hourly specified limit, using an appropriate amount of additives. Similarly, 57% reduction of SO2 annual total emission leads to no exceedance in predicted concentrations for the year 2009. The application of the state of the art technology, ESP has reduced about 90% of PM emissions for the year 2009.

Since 1987, the Petroleum Division of the American Chemical Society (ACS) has sponsored at 3 year intervals an international symposium on fluid cracking catalysts (FCC) technology. This volume collects the recent progress of this technology as reported in the papers presented during the 232th National Meeting of the ACS in San Francisco, September 10-14, 2006. Sixty-six years after the introduction of the fluid cracking catalyst process, it remains the main process of gasoline generation for the estimated 237 millions cars on US roads. Catalysts testing and evaluation still remains a subject of interest, debate and controversy. Lambda sweep testing, testing of SOx, NOx and combustion promoters have been discussed in details together with catalyst evaluation for atmospheric residues and metal contaminated oils cracking. Of particular interest has been the introduction of novel concept in process design aimed at improving cracked product selectivity such as two-stage risers for better gasoline and olefins production and downer technology for high severity processes . The importance of solid state nuclear magnetic resonance (NMR) in the study of crude oils, catalysts and reaction products are illustrated by several examples. Two contributions describe the use of predictive methods to understand FCC aging and deactivation and personal overviews of the development of SOx and combustion promoters technology are presented. * Presents findings from the tri-annual international symposium on fluid cracking catalysts (FCC) technology, sponsored by the Petroleum Division of the American Chemical Society (ACS) * Two contributions describe the use of predictive methods to understand FCC aging and deactivation * Personal overviews by the authors of the development of SOx and combustion promoters technology

Since the late 1970s there has been an explosion of industrial and academic interest in circulating fluidized beds. In part, the attention has arisen due to the environmental advantages associated with CFB (circulating . fluidized bed) combustion systems, the incorporation of riser reactors employing cir culating fluidized bed technology in petroleum refineries for fluid catalytic cracking and, to a lesser extent, the successes of CFB technology for calcina tion reactions and Fischer-Tropsch synthesis. In part, it was also the case that too much attention had been devoted to bubbling fluidized beds and it was time to move on to more complex and more advantageous regime,S of operation. Since 1980 a number of

CFB processes have been commercialized. There have been five successful International Circulating Fluidized Bed Confer ences beginning in 1985, the most recent taking place in Beijing in May 1996. In addition, we have witnessed a host of other papers on CFB funda mentals and applications in journals and other archival publications. There have also been several review papers and books on specific CFB topics. However, there has been no comprehensive book reviewing the field and attempting to provide an overview of both fundamentals and applications. The purpose of this book is to fill this vacuum.

Reviews recent accomplishments in the field of fluid cracking catalysts (FCC). Discusses the development of more specialized and effective catalysts and processes as well as the modification of current technology to meet future challenges in fuel refining. Written by nearly 50 internationally recognized experts from academia and industry.

This thoroughly updated edition of Fluid Catalytic Cracking Handbook provides practical information on the design, operation, troubleshooting, and optimization of fluid catalytic cracking (FCC) facilities. Based on the author's years of field experience, this expanded, second edition covers the latest technologies to improve the profitability and reliability of the FCC units, and provides several "no-to-low-cost" practical recommendations. A new chapter supplies valuable recommendations for debottlenecking and optimizing the performance of cat cracker operations.

These proceedings reflect recent developments in the field of zeolite chemistry and catalysis with an emphasis on the role of a modifying component on the properties of the molecular sieve material. The plenary lectures and contributed papers concentrate on the problem of isomorphous substitution in a zeolitic framework; on the occlusion and the structure of metal, metal oxide, and metal sulphide clusters and complexes in the intracrystalline void volume of molecular sieves and zeolites as well as in the interlaminar space of layered compounds. Catalytic applications are discussed, not only in regard to traditional hydrocarbon transformation, but also in such areas as: reduction of SO2, decomposition of NO, reactions of sulphur containing compounds and conversion of CO, CO2 to hydrocarbons or of alcohols to oxygenated products. Because the book provides valuable data and information on new achievements in the zeolite material science and application, it will be of considerable interest to all research groups involved in zeolite science.

This book reviews achievements in industrial chemistry and engineering, including both established and emerging areas of technology. Each of the 12 chapters provides coverage from basic science to technological principles.

This extensively updated second edition of the already valuable reference targets research chemists and engineers who have chosen a career in the complex and essential petroleum industry, as well as other professionals just entering the industry who seek a comprehensive and accessible resource on petroleum processing. The handbook describes and discusses the key components and

processes that make up the petroleum refining industry. Beginning with the basics of crude oils and their nature, it continues with the commercial products derived from refining and with related issues concerning their environmental impact. More in depth coverage of many topics previously covered in the first edition, such as hydraulic fracturing or fracking as it is often termed, help ensure this reference remains a relevant and up-to- date resource. At its core is a complete overview of the processes that make up a modern refinery, plus a brief history of the development of processes. Also described in detail are design techniques, operations and in the case of catalytic units, the chemistry of the reaction routes. These discussions are supported by calculation procedures and examples, which enable readers to use today's simulation-software packages. The handbook also covers off-sites and utilities, as well as environmental and safety aspects relevant to the industry. The chapter on refinery planning covers both operational planning and the decision making procedures for new or revamped processes. Major equipment used in the industry is reviewed along with details and examples of the process specifications for each. An extensive glossary and dictionary of the terms and expressions used in petroleum refining, plus appendices supplying data such as converging factors and selected crude oil assays, as well as an example of optimizing a refinery configuration using linear programming are all included to aid the reader. The 2nd edition of the Handbook of Petroleum Processing is an indispensable desk reference for chemists and engineers as well as an essential part of the libraries of universities with a chemical engineering faculty and oil refineries and engineering firms performing support functions or construction.

Fundamentals of Petroleum Refining presents the fundamentals of thermodynamics and kinetics, and it explains the scientific background essential for understanding refinery operations. The text also provides a detailed introduction to refinery engineering topics, ranging from the basic principles and unit operations to overall refinery economics. The book covers important topics, such as clean fuels, gasification, biofuels, and environmental impact of refining, which are not commonly discussed in most refinery textbooks. Throughout the source, problem sets and examples are given to help the reader practice and apply the fundamental principles of refining. Chapters 1-10 can be used as core materials for teaching undergraduate courses. The first two chapters present an introduction to the petroleum refining industry and then focus on feedstocks and products. Thermophysical properties of crude oils and petroleum fractions, including processes of atmospheric and vacuum distillations, are discussed in Chapters 3 and 4. Conversion processes, product blending, and alkylation are covered in chapters 5-10. The remaining chapters discuss hydrogen production, clean fuel production, refining economics and safety, acid gas treatment and removal, and methods for environmental and effluent treatments. This source can serve both professionals and students (on undergraduate and graduate levels) of Chemical and Petroleum Engineering, Chemistry, and Chemical Technology.

Beginners in the engineering field, specifically in the oil and gas industry, may also find this book invaluable. Provides balanced coverage of fundamental and operational topics Includes spreadsheets and process simulators for showing trends and simulation case studies Relates processing to planning and management to give an integrated picture of refining

The primary focus of this book as a whole is on performance - performance of the catalyst, of its surface, of the FCC unit, of the feedstocks employed, of the analytical methods used to characterize the catalysts, and of environmentally directed regulations that govern the production of transportation fuels from petroleum. The emphasis on catalyst performance, particularly commercial performance, essentially dictated that the chapter authors be experienced industrial catalytic chemists and engineers. However, each author approached the task with a clear-cut obligation to connect the roots of the science of FCC catalysis with the technology. Fluid Catalytic Cracking : Science and Technology has been written for workers in industrial catalysis and academia, including graduate students in chemistry or chemical engineering who are interested in acquiring an overall knowledge of one of the world's most important areas of catalysis. The book is concise, each topic is treated briefly; complete, all aspects of FCC catalysis are covered; and clear, anyone involved in this field will find topics of interest.--[Source inconnue].

A review of the recent literature on a method of oomphing gasoline that has become important because of the phase-down of lead in gasoline. The treatment is comprehensive rather than specific, but details of a few selected catalysts and zeolites are provided. The classifications of high-silica Y zeo

Provides a holistic approach that looks at changing process conditions, possible process design changes, and process technology upgrades Includes process integration techniques for improving process designs and for applying optimization techniques for improving operations focusing on hydroprocessing units. Discusses in details all important aspects of hydroprocessing – including catalytic materials, reaction mechanism, as well as process design, operation and control, troubleshooting and optimization Methods and tools are introduced that have a successful application track record at UOP and many industrial plants in recent years Includes relevant calculations/software/technologies hosted online for purchasers of the book

To meet changing market demands that have stringent emission standards and to ensure proper performance in refinery units, evaluation of novel catalyst designs and results from material characterization and testing of catalysts are of crucial importance for refiners as well as for catalyst manufacturers. This book highlights recent developments in the application of refinery catalysts in selected units such as fluid catalytic cracking (FCC), hydrogen production for hydroprocessing units, hydrotreating, hydrocracking, and sustainable processing of biomass into biofuels.

Modeling and Simulation of Catalytic Reactors for Petroleum Refining deals with fundamental descriptions of the main conversion processes employed in the petroleum refining industry: catalytic hydrotreating, catalytic reforming, and fluid catalytic cracking. Common approaches for modeling of catalytic reactors for steady-state and dynamic simulations are also described and analyzed. Aspects such as thermodynamics,

reaction kinetics, process variables, process scheme, and reactor design are discussed in detail from both research and commercial points of view. Results of simulation with the developed models are compared with those determined at pilot plant scale as well as commercial practice. Kinetics data used in the reactor model are either taken from the literature or obtained under controlled experiments at the laboratory.

Contemporary Catalysis: Fundamentals and Current Applications deals with the fundamentals and modern practical applications of catalysis. Topics addressed include historical development and the importance of heterogeneous catalysis in the modern world, surfaces and adsorption, the catalyst (preparation and characterization), the reactor (integral and differential reactors, etc.), and an introduction to spectroscopic and thermal characterization techniques. Building on this foundation, the book continues with chapters on important industrial processes, potential processes and separate chapters on syngas production, Fischer Tropsch synthesis, petroleum refining, environmental protection, and biomass conversion. Contemporary Catalysis is an essential resource for chemists, physical chemists, and chemical engineers, as well as graduate and post graduate students in catalysis and reaction engineering. Covers all aspects of catalysis in a carefully organized text Includes material on historical development Provides a wide range of student tasks, case studies, and supplementary, web-based materials that are regularly updated

Zeolites have been the focus of intensive activity and growth in applications over the past 25 years in ion exchange, in adsorp tion and in catalytic process technology. Beginning with the syn thetic zeolites A,X and Y, continuing into the emerging ZSM series, and including selected natural zeolites, applications span the range from large-scale purification and separation to such major petroleum and petrochemical processes as catalytic cracking and aromatics alkylation. The future promises several new areas of signiciant use as our energy resource base is expanded. As a result, a NATO Advanced Study Institute on Zeolites was held in Alcabideche, Portugal, May 1-12, 1983. Its purpose was to summarize the state-of-the-art in zeolite science and technology, with particular emphasis on recent developments. This summary is intended to complement presentations of the latest research results at the 1983 International Zeolites Association meeting in .Reno, Nevada - USA. Both the fundamentals concepts and industrial applications are addressed in the lectures of the Institute. Individual chapters cover historical development, structure, crystallography and synthesis techniques. Basic principles of adsorption, diffusion, ion exchange and acidity are reviewed. A section on catalysis addresses shape selectivity, transition metals, bifunctional catalysis and "methanol to-gasoline". Included in the section on industrial applications are chapters on reactor and adsorber design, catalytic cracking, xylene and n -paraffins isomerization, as well as ion exchange and adsorption.

In chemical processes, the progressive deactivation of solid catalysts is a major economic concern and mastering their stability has become as essential as controlling their activity and selectivity. For these reasons, there is a strong motivation to understand the mechanisms leading to any loss in activity and/or selectivity and to find out the efficient preventive measures and regenerative solutions that open the way towards cheaper and cleaner processes. This book covers the fundamental and applied aspects of solid catalyst deactivation in a comprehensive way and encompasses the state of the art in the field of reactions catalyzed by zeolites. This particular choice is

justified by the widespread use of molecular sieves in refining, petrochemicals and organic chemicals synthesis processes, by the large variety in the nature of their active sites (acid, base, acid-base, redox, bifunctional) and especially by their peculiar features, in terms of crystallinity, structural order and textural properties, which make them ideal models for heterogeneous catalysis. The aim of this book is to be a critical review in the field of zeolite deactivation and regeneration by collecting contributions from experts in the field which describe the factors, explain the techniques to study the causes and suggest methods to prevent (or limit) catalyst deactivation. At the same time, a selection of commercial processes and exemplar cases provides the reader with theoretical insights and practical hints on the deactivation mechanisms and draws attention to the key role played by the loss of activity on process design and industrial practice./a

This volume looks at the recent progress of this technology as reported in the 21 papers presented during the 219th National Meeting of the ACS in New York, September 5-11, 2003. In addition, the volume focuses on the use of modern spectroscopic techniques for the generation of detailed structural analysis required for the advancement of the science of FCC design. Other chapters look at the use and importance of solid state nuclear magnetic resonance (NMR), microcalorimetry and atomic force microscopy (AFM) to the study of FCCs and discussing strategies to control pollutant emissions from a refinery FCCU and looking at advances in FCC preparation.

This book is devoted to the new development of zeolitic catalysts with an emphasis on new strategies for the preparation of zeolites, novel techniques for their characterization and emerging applications of zeolites as catalysts for sustainable chemistry, especially in the fields of energy, biomass conversion and environmental protection. Over the years, energy and the environment have become the most important global issues, while zeolitic catalysts play important roles in addressing them. With individual chapters written by leading experts, this book offers an essential reference work for researchers and professionals in both academia and industry. Feng-Shou Xiao is a Professor at the Department of Chemistry, Zhejiang University, China. Xiangju Meng is an Associate Professor at the Department of Chemistry, Zhejiang University, China.

Fluid catalytic cracking (FCC) is the dominant conversion process in petroleum refineries and the major contributor to "value added" in the refining process. Successful operation of the FCC unit is critical to the operation of the FCC unit is critical to the operating success of most refineries. This book provides a complete and in-depth view of FCC process, design and operating principles, and the current FCC technologies available to the refining industry.

Catalyst production for the transformation of crudes into gasoline and other fuel products is a billion dollar/year business and fluid cracking catalysts (FCCs) represent almost half of the refinery catalyst market. During the cracking reactions, the FCC surface is contaminated by metals (Ni, V, Fe, Cu, Na) and by coke deposition. As a result, the catalyst activity and product selectivity is reduced to unacceptable levels thus forcing refiners to replace part of the recirculating equilibrium FCC inventory with fresh FCC to compensate for losses in catalyst performance. About 1,100 tons/day of FCC are used worldwide in over 200 fluid cracking catalyst units (FCCUs). It is for these reasons that refiners' interest in FCC research has remained high through the years

almost independantly, of crude oil prices. However, recent oil company mergers and the dissolution of research laboratories, have drastically decreased the number of researchers involved in petroleum refining research projects; as a result the emphasis of research has shifted from new materials to process improvements and this trend is clearly reflected in the type of papers contained in this volume. Modern spectroscopic techniques continue to be essential in the understanding of catalyst performance and several chapters in the book describe the use of 27Al, 29Si and 13C NMR to study variation in FCC acidity during aging and coke deposition. In addition several chapters have been dedicated to the modeling of FCC deactivation, and to the understanding of contact times on FCC performance. Refiners efforts to conform with environmental regulations are reflected in chapters dealing with sulfur removal, metals contaminants and olefin generation.

As refiners worldwide meet crude oil quality problems and address environmental issues and regulations, development of new fluid catalytic cracking (FCC) formulations are essential. In this volume, theoretical and applied aspects of cracking are discussed in chapters dealing with the origin and effects of strong acidity, modelling, catalyst testing, residue processing, and additive usage. Several chapters combine catalyst design with modern characterization techniques to provide guidance in the difficult problem of cracking metal-contaminated feedstocks.