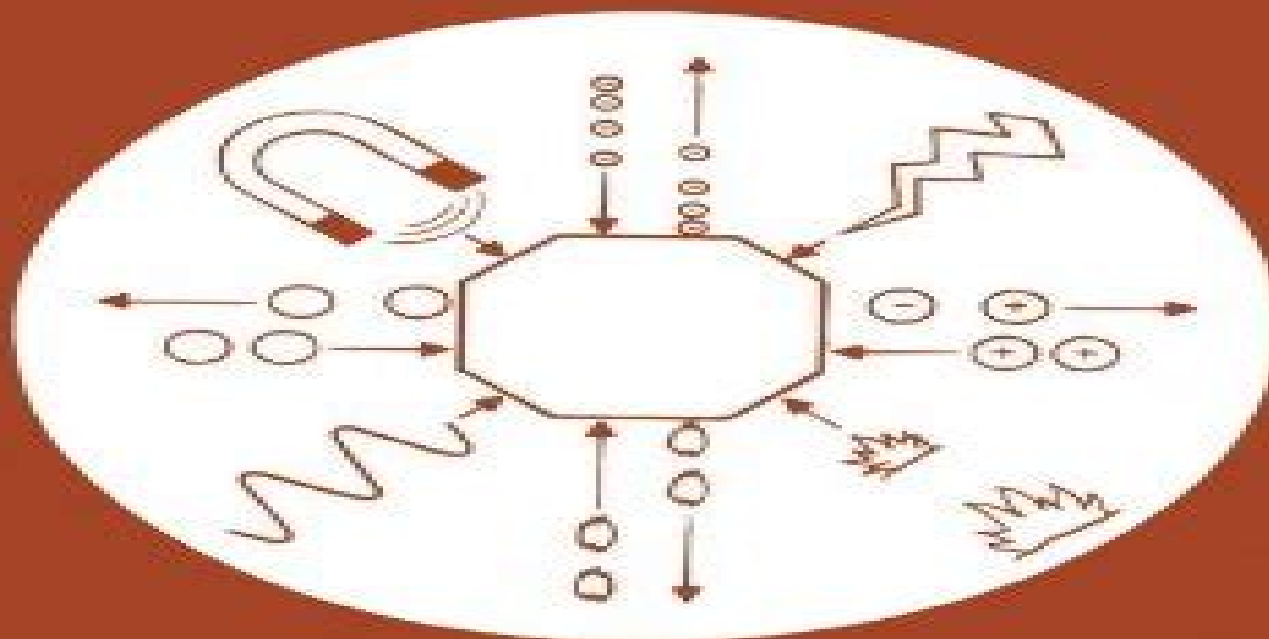


studies in surface science and catalysis



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**METHODS FOR MONITORING AND
DIAGNOSING THE EFFICIENCY OF
CATALYTIC CONVERTERS**

A Patent - oriented Survey

Marios Sideris



elsevier

Methods For Monitoring And Diagnosing The Efficiency Of Catalytic Converters A Patent Oriented Survey

**Toshiaki Kabe,Atsushi Ishihara,Eika
Weihua Qian,I. Putu Sutrisna,Yaeko
Kabe**

Methods For Monitoring And Diagnosing The Efficiency Of Catalytic Converters A Patent Oriented Survey:

Methods for Monitoring and Diagnosing the Efficiency of Catalytic Converters M. Sideris, 1998-06-19 The dramatic evolution of catalytic converters in the last thirty years was a result of a need worldwide to reduce pollution created by the exhaust gases of internal combustion engines Environmental concerns have led American Japanese and European Union EU legislation to pose continuously stricter emission limits for petrol engines in the last decades The catalytic converter has become the most important means of exhaust treatment to achieve the desired emission limits The international legislation has also created a need for a regular assessment of the efficiency of the catalytic converter in order to detect a deterioration of its conversion efficiency as soon as this deterioration takes place The assessment of conversion efficiency of a catalytic converter can take place during normal driving of a vehicle on board diagnosis or OBD or in a workshop by specialized technicians The most important methods nowadays are the OBD methods The evolution of methods concerned with OBD and non OBD monitoring and diagnosing of efficiency of catalytic converters of internal combustion engines is described based on patents and published patent applications Non patent references are also used The basic principles of modern catalytic converters are described in an extensive Introduction where the importance of monitoring and diagnosing the efficiency of catalytic converters is demonstrated The book is divided into four parts The first part describes methods involving the use of oxygen or air fuel exhaust gas sensors to determine the oxygen storage capacity of a catalytic converter The second part describes methods involving the use of temperature sensors to determine the exothermic reaction capacity of a catalytic converter The third part describes all other methods existing in patent literature that monitor and diagnose the efficiency of catalytic converters The great majority of the methods of the third part involves exhaust gas concentration measurements The fourth part comprises a general discussion of all methods described In the beginning of each part a short introduction is given to explain the problem that the methods attempt to solve The methods in each part are presented in chronological order per patent applicant This helps to evaluate how the patent applicant has improved his methods over time A patent number index with information about the patent applicants inventors priorities and patent families an inventor index a company index and a subject index can be found at the end of the book **Oxygen storage**

dominated three-way catalyst modeling Jeremias Bickel, 2022-01-20 The key to achieve optimal emission performance of a modern three way catalyst TWC under transient engine operating conditions is to maintain an optimal oxidation state of the oxygen storage material inside the washcoat of the catalyst This work demonstrates how simplified kinetic models can be developed that allow for accurately predicting the oxygen storage level under dynamic operation *New Trends and Developments in Automotive Industry* Marcello Chiaberge, 2011-01-08 This book is divided in five main parts production technology system production machinery design and materials and tries to show emerging solutions in automotive industry fields related to OEMs and no OEMs sectors in order to show the vitality of this leading industry for worldwide economies

and related important impacts on other industrial sectors and their environmental sub products **Fluid Catalytic Cracking VII:** ,2011-09-22 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 SO_x NO_x 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 SO_x 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 SO_x and combustion promoters technology *Fluid Catalytic Cracking V* M.L. Occelli, P. O'Connor, 2001-04-27 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

Catalytic Polymerization of Cycloolefins V. Dragutan, R. Streck, 2000-06-26 This book covers the most important topics concerning cationic Ziegler Natta and ring opening metathesis polymerization of cycloolefins The work describes the major pathways that cycloolefins can follow under the action of specific catalytic systems essentially vinyl and ring opening polymerization both reaction types allowing the manufacture of distinct products with wide applicability in modern technologies The comprehensive data available on this subject are logically and systematically selected and reviewed throughout 18 chapters according to the basic catalytic processes involved types of monomers and catalysts employed reaction conditions and application fields The modern trends in design of chiral metallocene catalysts well defined living metathesis catalysts catalysts tolerant toward functionalities and water systems are highlighted The book discusses in detail the relevant aspects of these processes including reaction thermodynamics kinetics mechanisms and stereochemistry and correlates the structure of produced polymers with their chemical and physical mechanical properties Related important topics include Ziegler Natta polymerization of olefins and dienes atom transfer radical polymerization of vinyl compounds metathesis of olefins and acetylenes acyclic diene metathesis reaction carbonyl olefination reaction metathesis polymerization of acetylenes metathesis degradation of polymers and ring opening polymerization of heterocycles Special emphasis is laid upon the manufacture of commercial products new polymers and copolymers of potential interest for industry and design and synthesis of speciality polymers with particular structures and architectures and desired properties The book critically evaluates the most recent achievements reported in this field and outlines the modern trends on the research and application of the catalytic processes for cycloolefin polymerization For the first time comprehensive information about the published data on the subject up to now is provided for both academic and industrial researchers working in the areas of polymer chemistry organic and organometallic chemistry surface science and catalysis petrochemistry and chemical engineering This stimulating book offers an enlightening introduction and a quick documentation on the subject as well as a solid background in this field Moreover the work offers a wealth of useful information for specialists applying polymers in various scientific and industrial areas

Fluid Catalytic Cracking VI: Preparation and Characterization of Catalysts Mario L. Occelli, 2004-07-06 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

Experiments in Catalytic Reaction Engineering J.M. Berty, 1999-08-11 The science of catalytic reaction engineering studies the catalyst and the catalytic process in the laboratory in order to predict how they will perform

in production scale reactors Surprises are to be avoided in the scaleup of industrial processes The laboratory results must account for flow heat and mass transfer influences on reaction rate to be useful for scaleup Calculated performance based on these results must also be useful to maximization of profit and safety and minimization of pollution To this end information on products as well as byproducts and heat produced must be generated If a sufficiently large database of knowledge is produced optimization studies will be possible later if economic conditions change The field of reaction engineering required new tools For kinetic and catalyst testing the most successful of these tools was the internal recycle reactor Studies in recycle reactors can be made under well defined conditions of flow and associated transfer processes and close to commercial operation The recycle reactor eliminates or minimizes the effect of transfer process and allows the remaining ones to be known Features of this book Provides insight into a field that is neither well understood nor properly appreciated Gives a deeper understanding of reaction engineering practice Helps avoid frustration and disappointment in industrial research This book is short and clear enough to assist all members of the R D and Engineering team whether reaction engineers or specialists in other fields This is critical in this new age of computation and communication when team members must each know at least something of their colleagues fields Additionally many scientists in more exploratory or fundamental fields can use recycle reactors to study basic phenomena free of transfer interactions *Reaction Kinetics and the Development of Catalytic Processes* G.F. Froment,K.C. Waugh,1999-03-18 The symposium Reaction Kinetics and the Development of Catalytic Processes is the continuation of the very successful International Symposium Dynamics of Surfaces and Reaction Kinetics in Heterogeneous Catalysis held in September 1997 in Antwerp Belgium These proceedings contain a unique series of top level plenary lectures mainly focused on the dynamics of catalytic surfaces the interaction of the reacting molecules with the solid catalyst the elementary steps of reaction pathways and molecular kinetics Surface science techniques molecular modeling transient kinetic studies sophisticated and specific reactors are included to a growing extent in the kinetic modeling and the development of catalytic processes How this is practiced today and how it will evolve in the coming years and what benefit can be expected for a more fundamentally based approach is the aim of the symposium

Catalyst Deactivation 2001 J.J. Spivey,G.W. Roberts,B.H. Davis,2001-09-21 This proceedings contains the papers presented at the 9th International Symposium on Catalyst Deactivation held in Lexington KY USA on 7 10 October 2001

Preparation of Catalysts VII R. Maggi,J.A. Martens,G. Poncelet,P. Grange,P.A. Jacobs,B. Delmon,1998-08-17 The proceedings of the VIIth International Symposium on the Scientific Bases for the Preparation of Heterogeneous Catalysts are in line with the general scope of this series of events Emphasis in all Symposia has been on the scientific aspects of the preparation of new and industrial catalysts or on new methods of preparation rather than on the catalytic reactions in which such solids are ultimately used In the present context the catalytic event itself has only been considered as another though often decisive method of catalyst characterization Scientific Bases for the Preparation of Heterogeneous Catalysts E.

Gaigneaux, M Devillers, D.E. De Vos, S. Hermans, P. Jacobs, J. Martens, P. Ruiz, 2006-09-19 This volume of Studies in Surface Science and Catalysis contains the Proceedings of the 9th International Symposium on the Scientific Bases for the Preparation of Heterogeneous Catalysts held on the campus of the Universit catholique de Louvain UCL in Louvain la Neuve Belgium on September 10-14 2006 This series of symposia was initiated in 1975 on a regular 4 year interval basis The Symposium covered the following topics key aspects in catalysts preparation micro and mesoporous supports supported metal catalysts structured catalysts tailored zeolites catalysis by bases and catalysts for fuel production These topics served as guidelines for the sessions both in the programs of oral communications 41 contributions including 7 keynote communications one for each topic and poster presentations 101 contributions In addition the opening invited lecture addressed the question of scaling up high throughput experimental approaches Contains a collection of the papers presented at the workshop

Science and Technology in Catalysis K Eguchi, M Machida, I Yamanaka, 2007-11-27 Unsteady state operations of catalytic reactors provide plentiful opportunities for research and commercial realization of efficient heterogeneous catalytic processes Forced unsteady state conditions generate unique distributions of process parameters and catalyst states often unattainable with traditional steady state operation The unsteady states can be created by periodic changes in input flow parameters such as changes in inlet temperature and composition catalyst circulation through reaction and regeneration zones or periodic flow reversals through fixed catalyst bed This can result in increased productivity selectivity capital savings and operating cost reduction higher energy efficiency Efficient environmental technologies for treatment of toxic emissions acid rain and greenhouse gas emissions can also be developed using the unsteady state concept The Proceedings communicate recent progress in these areas of research and promote future development The aims are to establish relations between academia industry engineers and scientists from all over the world to stimulate new catalytic technologies as well as fundamental research and to create new concepts for the development of effective catalytic systems It presents the most up to date research in catalysis contains the most recent developments in catalytic research includes research finding as well as their application to industry a thorough source of information on the latest developments of industrial catalysis in Japan

Coal and Coal-Related Compounds Toshiaki Kabe, Atsushi Ishihara, Eika Weihua Qian, I. Putu Sutrisna, Yaeko Kabe, 2004-11-18 Coal is more abundant than petroleum and natural gas Further coal is not localized but can be used by many more countries than petroleum Therefore if we can establish coal utilization technology coal will bring about a great contribution to human life and society On the other hand shortage of petroleum and natural gas are anticipated in the second half of the 21st century To compensate the use of coal is expected to gradually increase during the 21st century In the future the development of the coal utilization technology will become more and more important to insure the supply of liquid fuels for transportation and carbon sources for the manufacture of chemicals and plastic materials In order to develop such technologies the elucidation of the structure of coal is a fundamental area of study Further more efficient coal

utilization technology must be established to meet environmental legislation One of the key technologies for this purpose is catalysis This volume provides detail of the basic and practical aspects of the science and technology of coal utilization with and without catalysts The actual structure of coal the chemistry included in the reactivity of coal the methods to elucidate the structure of coal and reaction mechanisms of coal conversion the most important catalyst for converting coal to liquid and gas the role of the catalysts in coal conversion the problems in the process engineering and how to meet environmental regulations are discussed in detail The recent progress in studies on the structure and reactivity of coal made over the last century is summarized and reviewed with emphasis on both fundamental and applied aspects of the science and technology for coal processing in the presence and absence of catalysts This book highlights the issues faced in trying to discover more efficient coal utilization technology Provides detailed discussion on how to meet environmental regulations and legislation Fills the gap between both the scientific and practical sides of coal utilization with and without catalysts

Zeolites and Ordered Mesoporous Materials: Progress and Prospects Jiri Cejka, Herman van Bekkum, 2005-10-03 Zeolites are the most frequently used industrial catalysts Their applications range from oil refining petrochemistry and the synthesis of special chemicals to environmental catalysis Rapid progress in basic research and the development of new processes has resulted in the first Federation of European Zeolite Associations FEZA School on Zeolites Zeolites and Ordered Mesoporous Materials Progress and Prospects reflects the programme of the first School on Zeolites held in Prague on August 20 21 2005 Readers gain insight into the synthesis of the ever expanding spectrum of zeolites zeotypes and ordered mesoporous materials including the use of zeolites and mesoporous materials as catalysts in organic conversions These range from the fascinating ship in bottle systems via cascade reactions to bulk applications in oil refining and petrochemistry Contributions from world experts enhance the book with select chapters on trends in the molecular sieves field zeolite structures ion exchange properties of zeolites advanced applications with unique technologies and opportunities and a chapter on natural zeolites Contains contributions from world experts in the field Includes an account of the frontier topic of high throughput techniques Reviews the application of quantum chemical methods to zeolite science to show the necessity of combining experimental and theoretical approaches

Oxide-based Systems at the Crossroads of Chemistry C. Colella, S. Coluccia, Aldo Gamba, 2001-11-27 This volume includes papers presented at the second International Workshop on Oxide based Systems at the Crossroads of Chemistry held at Villa Olmo in Como Italy 8 11 October The selected papers present the highlights of recent research in the field of oxide structure A wide range of oxidic materials including real oxides zeolites and layered structured systems is considered and described in terms of preparation methods structural characterization and the relation between active sites structure and catalytic properties The application of the most powerful simulation and physical chemical techniques show their usefulness in discovering and explaining structural and dynamic properties of complex materials Moreover the development of sophisticated spectroscopical and analytical techniques are shown to significantly improve the

growth of surface oxide science generating new tools for the knowledge of catalyst structure and reaction mechanisms An interesting feature is the inclusion of papers which show the mutual roles of experiment and theoretical models

Characterisation of Porous Solids V G. Kreysa, J.P. Baselt, K.K. Unger, 2000-04-11 The Fifth International Symposium on the Characterisation of Porous Solids COPS V was held at Heidelberg Germany from May 30 to June 2 1999 About 220 participants from 25 countries enjoyed a very successful meeting with 32 lectures and 155 poster presentations The Symposium started with a highly stimulating lecture by Sir John Meurig Thomas Cambridge highlighting the recent developments in engineering of new catalysts The following two full sessions were devoted to theory modelling and simulation which provide the basis for the interpretation of pore structural data of adsorbents and finely dispersed solids Sessions 2 and 3 focused on the advances in the synthesis and characterisation of highly ordered inorganic adsorbents and carbons Sessions 4 and 5 addressed important questions with respect to the characterisation of porous solids by sorption measurement and other related techniques The intensive three day programme provided a stimulating forum for the exchange of novel research findings concepts techniques and materials which are collected in this volume

Nanotechnology in Mesostructured Materials Sang-Eon Park, Ryong Ryoo, Wha-Seung Ahn, Chul Wee Lee, J.-S. Chang, 2003-06-19 In these proceedings the reader will find regular papers from many groups worldwide covering the most recent advances in mesostructured materials and providing future perspectives of nanotechnology Presents the Proceedings of the 3rd International Mesostructured Materials Symposium Discusses the most recent advances in synthesis characterization and applications of mesostructured materials **Molecular sieves**, 2005 *Biocatalysis in Oil Refining*, 2011-09-22 Biocatalysis in Oil Refining focuses on petroleum refining bioprocesses establishing a connection between science and technology The micro organisms and biomolecules examined for biocatalytic purposes for oil refining processes are thoroughly detailed Terminology used by biologists chemists and engineers is brought into a common language aiding the understanding of complex biological chemical engineering issues Problems to be addressed by the future R D activities and by new technologies are described and summarized in the last chapter Updated references Studying bioprocessing problems looking at opportunities for improvements and technology developments

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