

Adsorption Of Ammonia On Ni 11 1 Researchgate

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Studies in Surface Science and Catalysis 14: Vibrations at Surfaces documents the proceedings of the third International Conference on "Vibrations at Surfaces" held at Asilomar, California, from September 1-4, 1982. Almost all of the 102 papers presented at the meeting are published in this volume. The topics chosen for the eight sessions held over a span of three days were: (I) Vibrational Frequency Shifts and Widths-Lateral Interactions; (II) Dynamical Processes at Surfaces; (III) and (IV) Electron Loss Spectroscopy; (V) Raman and Surface Enhanced Raman Scattering; (VI) Infrared Absorption and Reflection Spectroscopy; (VII) Beam Surface Scattering Surface Phonons; (VIII) Electron Tunneling Spectroscopy - Surface Enhanced Raman Studies in Electrochemistry. In addition, C. B. Duke presented an introductory keynote surveying progress in the field since the last meeting. In the final session H. Ibach and T. Grimley presented conference overviews and future prospects for the field from an experimental and theoretical perspective. Also included in the Proceedings are four literature surveys on Energy Loss, Inelastic Tunneling, Infrared and Raman (SERS) papers.

Characteristics of the Adsorption of Nickel Ammonia Complexes on Silica Gel as Related to Structure
Chemisorption of Carbon Monoxide and Ammonia on Nickel and Iridium Surfaces
An Exploration of Nitrogen Adsorption and Subsequent Reduction on Nickel-Hydroxide Catalysts Using Density Functional Theory

Successful Design of Catalysts

Principles of Adsorption and Reaction on Solid Surfaces

Publications

Handbook of Thin Films, Five-Volume Set

Hydrogen Storage for Sustainability

Principles of Adsorption and Reaction on Solid Surfaces As with other books in the field, Principles of Adsorption and Reaction on Solid Surfaces describes what occurs when gases come in contact with various solid surfaces. But, unlike all the others, it also explains why. While the theory of surface reactions is still under active development, the approach Dr. Richard Masel takes in this book is to outline general principles derived from thermodynamics and reaction rate theory that can be applied to reactions on surfaces, and to indicate ways in which these principles may be applied. The book also provides a comprehensive treatment of the latest quantitative surface modeling techniques with numerous examples of their use in the fields of chemical engineering, physical chemistry, and materials science. A valuable working resource and an excellent graduate-level text, Principles of Adsorption and Reaction on Solid Surfaces provides readers with:

- * A detailed look at the latest advances in understanding and quantifying reactions on surfaces
- * In-depth reviews of all crucial background material
- * 40 solved examples illustrating how the methods apply to catalysis, physical vapor deposition, chemical vapor deposition, electrochemistry, and more
- * 340 problems and practice exercises
- * Sample computer programs
- * Universal plots of many key quantities
- * Detailed, class-tested derivations to help clarify key results

The recent development of quantitative techniques for modeling surface reactions has led to a number of exciting breakthroughs in our understanding of what happens when gases come in contact with solid surfaces. While many books have appeared describing various experimental modeling techniques and the results obtained through their application, until now, there has been no single-volume reference devoted to the fundamental principles governing the processes observed. The first book to focus on governing principles rather than experimental techniques or specific results, Principles of Adsorption and Reaction on Solid Surfaces provides students and professionals with a quantitative treatment of the application of principles derived from the fields of thermodynamics and reaction rate theory to the investigation of gas adsorption and reaction on solid surfaces. Writing for a broad-based audience including, among others, chemical engineers, chemists, and materials scientists, Dr. Richard I. Masel deftly balances basic background in areas such as statistical mechanics and kinetics with more advanced applications in specialized areas. Principles of Adsorption and Reaction on Solid Surfaces was also designed to provide readers an opportunity to quickly familiarize themselves with all of the important quantitative surface modeling techniques now in use. To that end, the author has included all of the key equations involved as well as numerous real-world illustrations and solved examples that help to illustrate how the equations can be applied. He has also provided computer programs along with universal plots that make it easy for readers to apply results to their own problems with little computational effort. Principles of Adsorption and Reaction on Solid Surfaces is a valuable working resource for chemical engineers, physical chemists, and materials scientists, and an excellent text for graduate students in those disciplines.

The Workshop on Desorption Induced by Electronic Transitions (DIET) took place May 12-14, 1982, in Williamsburg, Virginia. The meeting brought together, for the first time, most of the leading workers in the fields of electron and photon stimulated desorption from surfaces, as well as many workers in related fields, including sputtering, gas-phase photodissociation and solid-state theory. The emphasis of the workshop was on the microscopic mechanism of stimulated desorption. Many possible mechanisms have been proposed, and a few new ones emerged at the meeting. Though no consensus was reached, many views were espoused and criticized, frequently with considerable enthusiasm. The result was an appraisal of our current understanding of DIET, and a focus on the experimental and theoretical efforts most likely to lead to new insights. This volume is an attempt to record the information exchanged in this very successful workshop and, perhaps, convey some of the excitement of the field of DIET. The book is a collection of papers written by participants in the DIET workshop, including in addition a contribution from Dietrich Menzel, who was unable to attend. Thus, this book represents a complete statement of the state of the art of experimental and theoretical studies of DIET and related phenomena. More importantly, it addresses the interesting unsolved problems, and suggests strategies for unraveling them. We acknowledge the assistance given by the other members of the organizing committee, A. E. de Vries, R. Gomer, M. L. Knotek, D. Menzel and D. P.

Metal-Support and Metal-Additive Effects in Catalysis, Volume 11, documents the proceedings of an international symposium organized by the Institut de Recherches sur la Catalyse - CNRS - Villeurbanne and sponsored by the Centre National de la Recherche Scientifique, Ecully (Lyon), September 14-16, 1982. This volume contains 40 manuscripts that cover a wide range of topics. Among these are studies of metal-support interactions involving Pt/Al₂O₃, Pt/TiO₂, Fe/TiO₂, Pt/MgO, Rh /Al₂O₃, and Pt/CeO₂ catalysts. There are also separate chapters dealing with ethane, n-butane, and cyclohexane hydrogenolysis; skeletal isomerization of methylpentanes; the catalytic activity and selectivity of noble metals; CO hydrogenation over supported on SiO₂, Al₂O₃, Ti O₂, and Zr O₂ nickel catalysts; and the role of promoters in Pd catalysts for methanol synthesis. Subsequent chapters cover the poisoning of platinum and nickel by sulfur; C₆H₆ and CO chemisorption on Pt₇₈Ni₂₂ (111) single crystal alloy; the surface composition of industrial ammonia synthesis catalysts; and the role of alkalis and electronegative promoters on Fe and Ni catalysts.

New Frontiers in Catalysis, Parts A-C

Future Requirements and Development

Metal-Support and Metal-Additive Effects in Catalysis

Bibliography of Solid Adsorbents, 1943 to 1953

Proceedings of the First International Workshop, Williamsburg, Virginia, USA, May 12-14, 1982

THE PHYSICAL BASIS FOR HETEROGENEOUS CATALYSIS is the proceedings of the ninth Battelle Colloquium in the Materials Sciences, held in Gstaad, Switzerland, September 2-6, 1974. It took as its theme the application of modern theoretical and experimental surface physics to heterogeneous catalysis. Progress in the field by classical chemical methods seemed to have slowed down, at a time when the need for better catalysts was particularly great. The Organizing Committee thought it might be possible to accelerate progress by the application of the powerful techniques evolved in recent years for studying atomically clean surfaces. However, the translation of ideas derived from clean single crystal surfaces with well characterized chemisorbed layers to real catalysts with high ratios of surface to mass on which reactions were taking place and requiring transport of mass and energy is a giant step, raising many questions and requiring thorough discussion by surface physicists on the one hand and catalytic chemists on the other. The 1974 Battelle Colloquium provided a forum for this exchange. As its usual custom, the Colloquium started the first day of introductory lectures by three distinguished scientists who have contributed importantly over many years to this field.

to the Fundamental and Applied Catalysis Series Catalysis is important academically and industrially. It plays an essential role in the manufacture of a wide range of products, from gasoline and plastics to fertilizers and herbicides, which would otherwise be unobtainable or prohibitively expensive. There are few chemical-or oil-based material items in modern society that do not depend in some way on a catalytic stage in their manufacture. Apart from manufacturing processes, catalysis is finding other important and ever-increasing uses; for example, successful applications of catalysis in the control of pollution and its use in environmental control are certain to increase in the future. The commercial importance of catalysis and the diverse intellectual challenges of catalytic phenomena have stimulated study by a broad spectrum of scientists, including chemists, physicists, chemical engineers, and material scientists. Increasing research activity over the years has brought deeper levels of understanding, and these have been associated with a continually growing amount of published material. As recently as sixty years ago, Rideal and Taylor could still treat the subject comprehensively in a single volume, but by the 1950s Emmett required six volumes, and no conventional multivolume text could now cover the whole of catalysis in any depth. In view of this situation, we felt there was a need for a collection of monographs, each one of which would deal at an advanced level with a selected topic, so as to build a catalysis reference library.

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An Annotative Bibliographical Survey

A Manual for the Chemical Analysis of Metals

Publications of the National Bureau of Standards ... Catalog

Vibrations at Surfaces

Adsorption-desorption Phenomena

In July 1988, a Worldwide Catalysis Seminar was held to mark the 30th anniversary of the Catalysis Society of Japan. After the 9th International Congress on Catalysis in Calgary, about 25 Japanese researchers working on catalysis visited and held seminars in four countries. Each seminar focused on a specific subject, yet also covered a wide range of topics in catalysis, from the fundamental to the industrial stages. This volume, containing the proceedings of this unique event, reflects the successful way in which the seminars provided an opportunity for direct communication and discussion of how best to achieve the successful design of catalysts.

This book provides a review of worldwide developments in ammonia synthesis catalysts over the last 30 years. It focuses on the new generation of Fe_{1-x}O based catalysts and ruthenium catalysts — both are major breakthroughs for fused iron catalysts. The basic theory for ammonia synthesis is systematically explained, covering topics such as the chemical components, crystal structure, preparation, reduction, performance evaluation, characterization of the catalysts, the mechanism and kinetics of ammonia synthesis reaction. Both theory and practice are combined in this presentation, with emphasis on the research methods, application and exploitation of catalysts. The comprehensive volume includes an assessment of the economic and engineering aspects of ammonia plants based on the performance of catalysts. Recent developments in photo-catalysis, electro-catalysis, biocatalysis and new uses of ammonia are also introduced in this book. The author, Professor

Huazhang Liu, has been engaged in research and practice for more than 50 years in this field and was the inventor of the first $Fe_{1-x}O$ based catalysts in the world. He has done a lot of research on Fe_3O_4 based- and ruthenium based-catalysts, and has published more than 300 papers and obtained 21 patents during his career. Contents: Historical Evolution of Catalysts for Ammonia Synthesis Catalytic Reaction Mechanisms of Ammonia Synthesis Chemical Composition and Structure of Fused Iron Catalysts Preparation of Fused Iron Catalysts Reduction of Fused Iron Catalysts Ruthenium Based Ammonia Synthesis Catalysts Performance Evaluation and Characterization of Catalysts Performance and Application of Catalysts Effect of Catalyst Performance on the Economic Benefits of Catalytic Process Innovation and Speculation Readership: Researchers in academia and industry working on catalysts for ammonia synthesis. Keywords: Ammonia

Synthesis; Catalysts; Catalytic; Iron Catalyst; Fused Iron Catalyst; Ruthenium Catalyst Key Features: Provides a review of worldwide developments in ammonia synthesis catalysts over the last 30 years Focuses on the new generation of $Fe_{1-x}O$ based catalysts and ruthenium catalysts Combines theory and practice, with emphasis on research methods and industrial exploitation

This book presents sustainable synthetic pathways and modern applications of ammonia. It focuses on the production of ammonia using various catalytic systems and its use in fuel cells, membrane, agriculture, and renewable energy sectors. The book highlights the history, investigation, and development of sustainable pathways for ammonia production, current challenges, and state-of-the-art reviews. While discussing industrial applications, it fills the gap between laboratory research and viable applications in large-scale production.

Sustainable Ammonia Production

Chemical Kinetics and Catalysis

Dynamic Processes on Solid Surfaces

The Physical Basis for Heterogeneous Catalysis

Characteristics of the Adsorption of Nickel Ammonia Complexes on Silica Gel as Related to Structure

• Full solutions to question-types from top schools & colleges since 2003 • topical order to facilitate drilling • solutions to

complete and thorough encyclopedia of question–types • step-by-step solutions to “trick” questions • tendency towards carelessness is greatly reduced • most efficient method of learning, hence saves time • advanced tradebook • complete edition eBook available • visit www.yellowreef.com for sample chapters and more

These volumes comprise the proceedings of the major international meeting on catalysis which is held at 4 year intervals. The programme focussed on New Frontiers in Catalysis including nontraditional catalytic materials and environmental catalysis. The contributions cover a wide range of fundamental, applied, industrial and engineering aspects of catalysis. The extensive range of highly efficient industrial techniques for observing and characterizing catalytically important surfaces is evident. The programme covered the following sessions: Mechanism, theory, in situ methods; Catalytic reaction on atomically clean surfaces; Catalytic reaction on zeolites and related substances; New methods and principles for catalyst preparation; Hydrotreatment reactions (HDS, HDN); Characterization of catalysts, application of novel techniques; Selective oxidation; New catalytic aspects of heteropoly acids and related compounds; Reaction of hydrocarbons; Nontraditional catalytic materials; Fuel upgrading; Alkane activation; Acid-base catalysis; New selective catalytic reactons, fine chemicals; Environmental catalysis; Industrial catalysis, deactivation, reactivation; Synthesis from syngas; Electrocatalysis; Photocatalysis. The invited lectures and 433 papers included in these volumes present an update on all areas of catalysis and applications.

This five-volume handbook focuses on processing techniques, characterization methods, and physical properties of thin films (thin layers of insulating, conducting, or semiconductor material). The editor has composed five separate, thematic volumes on thin films of metals, semimetals, glasses, ceramics, alloys, organics, diamonds, graphites, porous materials, noncrystalline solids, supramolecules, polymers, copolymers, biopolymers, composites, blends, activated carbons, intermetallics, chalcogenides, dyes, pigments, nanostructured materials, biomaterials, inorganic/polymer composites, organoceramics, metallocenes, disordered systems, liquid crystals, quasicrystals, and layered structures. Thin films is a field of the utmost importance in today's materials science, electrical engineering and applied solid state physics; with both research and industrial applications in microelectronics, computer manufacturing, and physical devices. Advanced, high-performance computers, high-definition TV, digital camcorders, sensitive broadband imaging systems, flat-panel displays, robotic systems, and medical electronics and diagnostics are but a few examples of miniaturized device technologies that depend the utilization of thin film materials. The Handbook of Thin Films Materials is a comprehensive reference focusing on processing techniques, characterization methods, and physical properties of these thin film materials.

Proceedings of the II International Conference Held at Florence in April 1971

Nitrogen Compounds—Advances in Research and Application: 2012 Edition

An Exploration of Nitrogen Adsorption and Subsequent Reduction on Nickel-Hydroxide Catalysts Using Density Functional Theory

Determination of Metals in Natural and Treated Water

EuroCVD 17/CVD 17

This issue of ECS Transactions includes papers presented at the 2009 EuroCVD-17 and CVD 17 symposium. Topical areas covered include fundamentals of chemical vapor deposition (CVD), chemistry of precursors for CVD, synthesis of nanomaterials by CVD and related methods, industrial applications of CVD, and novel CVD reactors and processes. This issue is sold as a two-part set and also includes a CD-ROM of the entire issue.

When we see a jumbo jet at the airport, we sometimes wonder how such a huge, heavy plane can fly high in the sky. To the extent that we think in a static way, it is certainly not understandable. In such a manner, dynamics yields behavior quite different from statics. When we want to prepare an iron nitride, for example, one of the most orthodox ways is to put iron in a nitrogen atmosphere under pressures higher than the dissociation pressure of the iron nitride at temperatures sufficiently high to let the nitrogen penetrate into the bulk iron. This is the way thermodynamics tells us to proceed, which requires an elaborate, expensive high-pressure apparatus, sophisticated techniques, and great efforts. However, if we flow ammonia over the iron, even under low pressures, we can easily prepare the nitride-provided the hydrogen pressure is sufficiently low. Since the nitrogen desorption rate is the determining step of the ammonia decomposition on the iron surface, the virtual pressure of nitrogen at the surface can reach an extremely high level (as is generally accepted) because, in such a dynamic system, the driving force of the ammonia decomposition reaction pushes the nitrogen into the bulk iron to form the nitride. Thus, dynamics is an approach considerably different from statics.

Determination of Metals in Natural and Treated Waters draws together all the available literature and presents in a systematic fashion the latest analytical techniques for detecting metals in non-saline and saline natural and treated water. Broad outlines of different methods and their applicability in certain situations are given allowing the chem

National Bureau of Standards Circular

Ammonia Synthesis Catalysts

Desorption Induced by Electronic Transitions DIET I

Synthetic Zeolites

A-level Chemistry Challenging Drill Solutions (Yellowreef)

With both nickel and cobalt featuring heavily in modern industry, there is an ongoing and intense interest in ore supplies and processing, applications development, and recycling. This book presents a collection of authoritative papers covering the latest advances in all aspects of nickel and cobalt processing, including fundamentals, technology, operating practices, and related areas of Platinum-Group Metals (PGM) processing. Special emphasis is given to the treatment of sulphide and laterite ores, concentrates, and secondary materials for the production of nickel and cobalt. The main goal of this project had been to use model systems to correlate selectivities in partial oxidation catalysis with the presence of specific sites on the surface of the catalyst. Extensive work was performed this year on characterizing oxygen-treated nickel surfaces by chemical means. Specifically, the surface chemistry of ammonia coadsorbed with atomic oxygen on Ni(110) single-crystal surfaces was studied by temperature-programmed desorption (TPD) and X-ray photoelectron spectroscopy (XPS). It was determined that at intermediate oxygen coverages direct ammonia adsorption on nickel sites is suppressed, but a new high-temperature reaction regime is generated at 400 K where NH_x surface fragments are rehydrogenated concurrently with the production of water and molecular hydrogen. The extensive isotope scrambling and hydrogen transfer seen from nitrogen- to oxygen-containing surface intermediates, and the optimum yields seen for this 400 K state at intermediate oxygen coverages, strongly suggest the direct interaction of the adsorbed ammonia with oxygen atoms at the end of the -Ni-O- rows that form upon reconstruction of the surface. Hydrogen transfer between ammonia and oxygen appears to take place directly via hydrogen bonding, and to be reversible but biased towards water formation. An equilibrium is reached between the produced water and the reacting surface oxygen and hydrogen. The strong influence of the OH surface groups on the thermal chemistry of the adsorbed ammonia was interpreted in terms of the adsorbing geometry of the OH groups on the surface, and of hydrogen bonding between adsorbed OH and NH₃ species. In terms of alcohol reactivity, the adsorption of 2-iodoethanol, a precursor for the preparation of 2-hydroxyethyl and oxametallacycle surface species, was found to lead to two configurations involving either just the iodine atom or both iodine and hydroxyl ends of the molecule. A complex chemical behavior starts around 140 K with the production of small amounts of ethylene and water, most likely via the concerted decomposition or disproportionation of the adsorbed molecular species. The bulk of the 2-iodoethanol decomposes at about 150 K via an initial carbon-iodine scission to form -O(H)CH₂CH₂- (~80%) and 2-hydroxyethyl (~20%) intermediates. Two competing reactions are involved with the subsequent conversion of the 2-hydroxyethyl species around 160 K, a reductive elimination with surface hydrogen to yield ethanol, and a [beta]-H elimination to surface vinyl alcohol. The -O(H)CH₂CH₂-, on the other hand, dehydrogenates to a -OCH₂CH₂- oxametallacycle species about the same temperature. Both 2-hydroxyethyl and oxametallacycle species tautomerize to acetaldehyde, around 210 K and above 250 K, respectively, and some of that acetaldehyde desorbs while the rest decomposes to hydrogen and carbon monoxide. We contend that a

better understanding of the surface chemistry of oxygen-containing surfaces can lead to better selectivities in catalysis. This is arguably the most important issue in the field of catalysis in the near future, and one that impacts several technologies of interest to DOE such as the manufacturing of speciality chemicals and the control and removal of pollutants. Additional work was performed on the characterization of the chemistry of methyl and methylene adsorbed species on oxygen-treated nickel surfaces. Complex chemistry was observed involving not only hydrogenation and dehydrogenation steps, but also C-C couplings and methylene insertions to produce heavier hydrocarbons, and oxygen insertion reactions that yield oxygenates. Finally, a dual titration technique employing xenon and a chemically sensitive probe was developed to identify minority catalytic sites on oxide surfaces. In the case of oxygen-treated Ni(110) single crystals, it was found that both hydrogen transfer with adsorbed water or ammonia and certain hydrocarbon hydrogenation reactions take place at the end of the -Ni-O rows that form in this system. Carbon and nitrogen oxides, on the other hand, display no preference for adsorption on those sites.

Carbon neutral hydrogen technologies play a role in preventing climate change and the capacity to store and transport hydrogen will be critical in the growing hydrogen economy. This book focuses on new developments of hydrogen storage technologies and deals with an overview of the materials and science necessary for storing hydrogen with great attention to the synthesis, kinetics, and thermodynamics of new advanced materials e.a. porous carbon and nanomaterials. Ideal book for students of materials science, chemistry, physics; for researchers, chemical- and mechanical engineers, for industrialists, policymakers, safety agencies and governments.

Circular of the National Bureau of Standards

Advanced Functional Solid Catalysts for Biomass Valorization

Innovation and Practice

Kinetics of Catalytic Ammonia Synthesis

Advanced Functional Solid Catalysts for Biomass Valorization presents the basic concepts in catalysis (homogeneous, heterogeneous, and enzymatic) and the properties of various kinds of heterogeneous solid catalysts, including their structure, porosity, particle size, BET surface area, acid-base, and redox properties. Useful information about biorefineries, types of biomass feedstocks, their structures and properties as well as about several potential catalytic routes for biomass upgrading to useful fuels and chemicals is provided in this book. Importantly, this book covers the most recent developments toward functionalization of various solid catalysts, optimization of catalysts' properties, developing cascade catalytic strategies, exploring reaction kinetics/mechanisms, and evaluating catalysts' stability/reusability during biomass upgrading. Current challenges and opportunities for the future biorefineries as well as for the design of advanced functional solid catalysts are critically discussed. Describes catalysis as a promising technology for the

development of eco-friendly and economically viable strategies for several important energy and environmental applications. Covers heterogeneous solid catalysts because of their versatile benefits in terms of catalysts' synthesis, production cost, stability, and reusability as compared to homogeneous liquid catalysts. Provides promising strategies for the design of new catalytic materials, such as carbon materials, metal-organic frameworks, zeolites, and mesoporous silicas. Describes functional solid catalysts for developing one-pot cascade processes for efficient biomass valorization and other vital chemical transformations.

Plasma catalysis is gaining increasing interest for various gas conversion applications, such as CO₂ conversion into value-added chemicals and fuels, N₂ fixation for the synthesis of NH₃ or NO_x, methane conversion into higher hydrocarbons or oxygenates. It is also widely used for air pollution control (e.g., VOC remediation). Plasma catalysis allows thermodynamically difficult reactions to proceed at ambient pressure and temperature, due to activation of the gas molecules by energetic electrons created in the plasma. However, plasma is very reactive but not selective, and thus a catalyst is needed to improve the selectivity. In spite of the growing interest in plasma catalysis, the underlying mechanisms of the (possible) synergy between plasma and catalyst are not yet fully understood. Indeed, plasma catalysis is quite complicated, as the plasma will affect the catalyst and vice versa. Moreover, due to the reactive plasma environment, the most suitable catalysts will probably be different from thermal catalysts. More research is needed to better understand the plasma-catalyst interactions, in order to further improve the applications.

Ammonia production is one of the most important processes in the world, having countless applications throughout many industries. With a goal of improving upon the current practice, we analyze the catalytic activity of Ni(OH)₂ for nitrogen reduction in hopes to demonstrate a favorable reduction pathway from N₂ (g) to NH₃ ammonia. Two mechanisms are explored: a dissociative mechanism that splits the N-N bond as the first step of the pathway, and an associative mechanism that protonates diatomic nitrogen prior to N-N dissociation. Using density functional theory (DFT) computation to determine adsorption Gibbs free energies, we tested several different surface terminations, including Ni⁺², HO⁻, and H⁺ to elucidate the stable state of the surface under N₂ reduction conditions. We varied the unit cell size to examine different surface structures. The results of our tests show that surface chemistry is unlikely to occur on the stoichiometric hydroxide-covered surface. More-favorable reaction pathways occur on the reduced nickel termination. With the top layer of hydroxide atoms removed, strong binding of intermediates to this surface may prevent NH₃ product formation and desorption. We provide some ideas on catalytic design that promote transition state stability to consider in future computational or experimental investigations.

Chemical Abstracts

A Rapid Method for the Determination of Heats of Adsorption and Some Values for Hydrogen on Nickel and Copper
Information Circular

Ni-Co 2013

Final Report, "Molecular Design of Hydrocarbon Oxidation Catalytic Processes."