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Symposium on Physics and Mechanics
of Ice Technical University of Den-
mark, Copenhagen, August 6-10, 1979

Ice Forces on Piles

H. SAEKI and A. OZAKI

Department of Civil Engineering, Hokkaido University, JAPAN

An investigation was made on the ice forces on an isolated vertical pile and several vertical piles which stood on forming a line. In order to ascertain the various effects of factors which exert an influence on the ice forces on piles, various (kinds of) experiments were carried out. The factors considered in these experiments are the relative velocity between an ice floe and a pile, the sectional shape of pile, aspect ratio, and the interference among piles. Finally, it was shown that the formula of the ice force on an isolated vertical pile proposed by the authors is widely applicable to the vertical pile structures.

The Fifth International Conference on
PORT AND OCEAN ENGINEERING
UNDER ARCTIC CONDITIONS At
The Norwegian Institute of Technology,
August 13-18, 1979

Experimental Study on Ice Forces on a Cone-Shaped and an Inclined Pile Structures

Hiroshi SAEKI, Toshiyuki ONO and Akira OZAKI

Department of Civil Engineering, Hokkaido University, Japan

Investigations were made on the ice forces exerting their effects on a cone-shaped and an inclined pile structures. Three kinds of experiments were carried out to measure the ice forces on sloping structures. They were the experiments on the ice forces on a cone-shaped structure and an inclined pile structure, impulsive forces on a cone-shaped structure and the coefficient of friction between the sea ice and the various materials used in off-shore structures.

Based on these experiments, several diagrams on the ice forces exerting their effects on a cone-shaped and an inclined pile structures and on the coefficient of friction for various materials were proposed.

The U.S.-Japan Binational Seminar on
Sedimentation, March 20-24, 1978,
Honolulu, Hawaii

Bed Forms and Hydraulic Relations for Alluvial Streams

Tsutomu KISHI

Professor of Civil Engineering, Hokkaido University,
Sapporo, 060, Japan

In this paper the author proposes first a new depth-velocity predictor for the flow over small-scale sedimentary waves. The results of application to field observations performed in the Ishikari River are described to give the conclusion that the predictor can be applied favorably when the values of depth-grain size ratio for the flow are smaller than 4×10^8 .

Second, the wave form spectra for well developed dunes are investigated. The spectral function is applied to discuss the accuracy of bed load measurements by the bed form observation.

Finally, the geometric characteristics of alternating bar bed and the hydraulic relations of a flow over it are discussed. Empirical expressions are given for the wave height, wave length, the friction factor and the migration velocity of the alternating bars.

7-th Regional Seminar on Earthquake
Engineering, Sept., 1979. Istanbul,
Turkey

Seismic Intensity, Acceleration and Their Attenuation Relations as Basis of Damage Evaluation, with Special Reference to the 1976 Çaldıran Earthquake

Yutaka OHTA

Department of Architectural Engineering Hokkaido University

A study on seismic strength and related problems in terms of intensity and acceleration is presented with special reference to the 1976 Çaldıran earthquake in eastern Turkey.

At the beginning, a short review of the previous works on seismic intensity, acceleration and their attenuation curves etc. are described and the unsolved problems following them were elucidated. Also the importance of the attenuation relations in pure and engineering seismology was stressed.

A somewhat all-inclusive model to interpret the general features of isoseismal intensity map, taking into consideration the finiteness of the earthquake fault, distribution of slips along a fault surface, and site soil conditions etc. is introduced and applied to the Çaldıran earthquake in Turkey. Superiority of the new model to the previously proposed models was clearly shown

by the comparison of correlation coefficients between observed and calculated intensities. A brief sensitivity analysis of parameters controlling the new model was added.

7-th Regional Seminar on Earthquake
Engineering, Sept., 1979. Istanbul,
Turkey

Some New Geotechnical Methods for Seismic Site Evaluation of Shallow and Deep Soil Deposits

Yutaka OHTA

Department of Architectural Engineering Hokkaido University

A few geotechnical methods effective for site evaluation of shallow and deep soil deposits are presented from an engineering seismological point of view.

In Part I, starting with an introduction of an easy capable shear wave velocity measurement by means of the Standard Penetration Test, it continues to show how to construct empirical shear wave velocity equations. Both are practical for shallow soils of which depth is less than several 10 meters.

The techniques described in Part II are applicable for deeply deposited sediments. These are elaborated down-hole velocity measurements and long-period microtremors observation. The former was successfully carried out by the temporary use of geophysical observation wells of which the depths are in the order of a few kilometers. However, it is a rare opportunity that such a deep well is available. So, as a substitute the long-period microtremors observation is employed for elucidating thick ground dynamic characteristics. The period range covered is from 1 sec up to 10 sec.

In the text brief explanations of each technique, examples, and their significance in the seismic site evaluation are delineated.

4th Congress of the International
Society for Rock Mechanics, Montreux,
Swisse, 1979

Measurement of Rock Movements Around Deep Mine Roadways Driven in Soft Rock—A Study of Yubari New Coal Mine

Shigenori KINOSHITA, Yoji ISHIJIMA, Atsushi FUKUSHIMA
and Satoshi FUKAI

In the Yubari New Coal Mines, the main roadways driven in soft rock (shale) are encountering maintenance difficulties due to the amount of pressure arising from the deep rock

cover of 900 to 1100 m. Field measurements have clarified that a creep-like rock movement occurring in the relaxed zone around the opening is the main cause of roadway closure. Convergence rate of the opening which does not decrease with time, except after the opening which does not decrease with time, except after the passage of a mining excavation over them, appears to have a close relationship with the extent of the relaxed zone and the quantity of water supplied. Rock bolting, as an aid to the current supporting system of the rigid steel arches, are now investigated for its effectiveness.

16th Application of Computers and
Operations Research in the Mineral
Industry, Tucson, Arizona, October 17-
19, 1979

Development and Application of a Computer System for Monitoring Seismicity Induced by Underground Coal Mining

T. ISOBE*, N. MORI**, K. SATO* and T. GOTO**

The measuring system utilizing a mini-computer was developed to observe the seismicity induced by working coal seams. The system facilitates Real-Time-Execution of seismic data by means of 32 kilo-words CPU and several I/O devices. The softwares were established to make pin point the source location of seismic events and statistical analysis of seismicity. The iterative least square method was incorporated in the source location program, whereas other statistical methods were applied to the reduction of seismic data to fewer useful indices such as the release rate of seismic energy, the b-value in the magnitude distribution etc. The system has been applied to the field investigation at Sunagawa Colliery in Hokkaido, and confirmed to be one of the most promising tools to survey the state of rock around underground excavations.

* Department of Resources Development Engineering, Hokkaido University

** Department of Mineral and Civil Engineering, Kitami Institute of Technology

International Conference on Acoustic
Emission, Inn at the Park Anaheim,
California, U.S.A., 1979

Acoustic Emission Activity in the Rock Around Underground Working Faces in Deep-Level Coal Seams

Yoshiteru WATANABE and Iwao NAKAJIMA

The acoustic emission activities accompanying the coal or rock outbursts were observed during cross-measure drivages at Sunagawa Coal Mine and Horonai Coal Mine. In practice, three outbursts which occurred after blasting were monitored successfully. The mechanism of the outburst occurrence was considered and the possibility of the forecasting of them was discussed on the basis of the observational results.

Actually, the acoustic emission activity after blasting became remarkably to a high degree prior to the outburst when working faces approach a geologically weak band with mylonite or a sandstone seam saturated with gas. Consequently, it was confirmed that the impending outburst could be forecasted with considerable accuracy by monitoring the degree of an increase in acoustic emission activity after blasting.

The International Symposium on Fine
Particles Processing, Las Vegas Hilton
Hotel, Las Vegas, Nevada, USA, 1980

An Experimental Study on the Mechanism of Spherical Agglomeration in Water

Takakatsu TAKAMORI, Tsuyoshi HIRAJIMA
and Masami TSUNEKAWA

In the spherical agglomeration in water, the pattern of the growth behaviour of agglomerates is essentially determined by the surface chemical properties of the particles and the oil-water interface.

When particles are suitably hydrophobic and oil-water interfacial tension is not too low under an adequate condition for agglomeration, large agglomerates are formed in the initial stage and micro-agglomerates do not appear.

When particles are poorly wetted by oil and the interfacial tension is low, initially micro-agglomerates are formed and, after certain aging time, they grow to large agglomerates in a relatively short time without the formation of intermediate size agglomerates.

Under adequate conditions, the amount of oil and power input do not produce any remarkable effect on the pattern of growth.

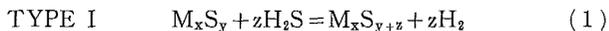
In the preliminary experiment of agglomeration, the Phase Inversion Method is convenient for the estimation of suitable conditions of the surface property.

3rd World Hydrogen Energy Conference, June 23-26, 1980, Tokyo, JAPAN

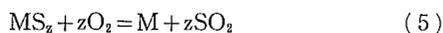
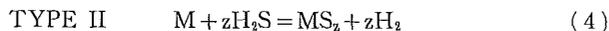
Recovery of Hydrogen from Hydrogen Sulfide with Metals or Metal Sulfides

H. KIUCHI, I. NAKAMURA, K. FUNAKI and T. TANAKA

Two types of processes were investigated for recovery of H₂ from H₂S formed by the direct reduction of sulfide ores.



For eq. (1), metallic Ag, FeS, Co₉S₈, Ni₃S₂ and CuFeS₂ were examined by following reasonings: the ease of reproducibility of Ag from Ag₂S, the use of non-stoichiometry of FeS, the small difference in reaction temperatures for Co₉S₈ and CoS, interconversion between Ni₃S₂ and NiS, and characterization by double sulfide CuFeS₂. Sulfurization and desulfurization were done under ambient and under normal or reduced pressure, respectively.



Eq. (5) is familiar in the smelting of sulfide ores and the experiments were carried out on Ag, Pb, Cu and Ni. Sulfurization of solid metal with H₂S tends to cease due to the formation of a dense sulfide film. Liquid Pb and Bi-Ag alloy were also examined as a means of eliminating such limitations to the reaction kinetics.

Presented at the Symposium on Emulsified Fuels in Combustion, U.S. Department of Transportation, Cambridge, MA, May 13-14, 1980

Influence of Fuel Properties on the Combustion in Diesel Engines Driven by Emulsified Fuel

Tadashi MURAYAMA* and Minoru TSUKAHARA**

The authors previously described that in a direct-injection Diesel engine not only some reduction in NO_x concentration of exhaust gas can be expected but also its specific fuel consumption and exhaust smoke can be remarkably improved if water to gas oil emulsified fuel is used in order to drive the engine.

In the present paper the authors show successfully how the influence of the properties of various emulsions composed of high-viscosity oil in particular and used as fuel, have on the engine performance.

When water to gas oil emulsion, water to bunker A oil emulsion and those containing a small quantity of methanol are used as fuel, the concentrations of NO_x , smoke and CO as well as the specific fuel consumption can be improved similarly to the results previously obtained, whereas the HC concentration increases.

Although the NO_x concentration can be remarkably reduced by means of water to bunker C oil emulsion, the specific fuel consumption cannot be so remarkably improved as expected and tends, on the contrary, to increase the retarded injection timing.

Separately from the experiments with actual engines, on the other hand, the evaporation time of various fuel droplets and the combustion time of the fuel spray on heating flat plate are measured under atmospheric pressure in order to investigate the combustion-promoting effect of emulsified fuel.

As a result, it was confirmed that the W/O emulsion composed of gas oil and water increasingly decreases the evaporation time in the spherical evaporation region than gas oil only. Between water to bunker C oil emulsion and bunker C oil only, on the contrary, no remarkable difference in evaporation time is observed within the spherical evaporation region, especially at high temperatures.

Based on the above-mentioned facts, it can be seen that bunker C oil emulsion, especially with a high water content, shows a slighter water explosion effect than gas oil emulsion and it is impossible to shorten sufficiently the combustion time.

* Hokkaido University, Sapporo

** Muroran Institute of Technology

IFAC SYMPOSIUM ON COMPUTER
AIDED DESIGN OF CONTROL SYS-
TEMS, Zürich, Switzerland, August
29-31, 1979

CAD Covering All Transfer Functions Attainable by Linear Compensation

Ryozaburo TAGAWA and Seiya YOGO

In the design of a linear feedback control system, the following transfer functions, i. e. (1) the transfer function between the reference input and the controlled variable and (2) the transfer function between the disturbance and the controlled variable, are important because they directly reflect the basic properties of the control system. When a controlled object is given, however, the transfer functions (1) and (2) which are attainable by realizable linear compensation are usually limited to the respective particular regions which depend on the properties of the given controlled object.

Recently, we have been successful in clarifying these particular regions, and we have been also successful in deriving a structure of compensator by the use of which all pairs of the transfer functions (1) and (2) within these particular regions are realized simultaneously.

The present paper gives a new CAD system of linear feedback control system which is based on these theoretical background.

International Conference on Power
System Monitoring and Control, June
24-26, 1980, London, U.K.

Dynamic State Estimation Including Anomaly Detection and Identification for Electric Power Systems

K. NISHIYA*, J. HASEGAWA* and T. KOIKE**

A novel method for detecting and identifying three fundamental anomalies, i. e., occurrence of bad data, changes in network configuration and sudden variation of states, in dynamic state estimation for electric power systems is proposed. Examination in innovation processes in the Kalman filter is suitably used in each step of detection of anomalies, discrimination of anomalies and application of counterplans. Discrimination of the anomalies is performed by a test for skewness of distributions of the processes. Counterplans, which are different for each case of the anomalies, are developed so as to prevent deterioration of the accuracy of the estimator. Simulation results show that this algorithm works excellently.

* Department of Electrical Eng., Faculty of Engineering, Hokkaido University

** Kitami Institute of Technology

International Conference on Plasma
Physics, Nagoya, Japan, April 7-11,
1980

**Magnetohydrodynamic Stability of an Axisymmetrical
Toroidal Sharp-Boundary Plasma with a Horizontally
Elongated Noncircular Cross Section**

Toshihisa HONMA, Masafumi KITO, Ikuo KAJI
and Ichiro FUKAI

A stability analysis is presented for an axisymmetrical toroidal sharp-boundary model of a plasma with a horizontally elongated non-circular cross section in the flat-ring cyclide coordinates, in which solutions of Laplace's equation can be expressed in terms of the Wangerin functions analytically. Since the arguments of the functions are given by the aspect and elongation ratio, the energy principle reduced to the Hermitian energy matrix can be treated without any expansion of the aspect ratio. Therefore, under the condition of fixed aspect or elongation ratios, the critical plasma beta and minimum safety factor of the plasma with a horizontally elongated noncircular cross section can be compared with those with circular and vertically elongated noncircular cross sections, which are represented in the toroidal and cap-cyclide coordinates, respectively. Our conclusions are: 1) The critical poloidal beta value in the equilibrium is analytically obtained as a function with respect to the aspect and elongation ratio. 2) A toroidally fat plasma is more stable than a slender one under the condition of a fixed elongation ratio. 3) The toroidal perturbation number $n=1$ is the worst mode against the stability.

National Telecommunications Confer-
ence 1979 (NTC '79), Washington, D.C.,
USA, November 27-29, 1979

**Joint Optimization of Receiver Filters and a DIR
in a QAM Transmission System Employing a
2-dimensional Viterbi Detector**

Yasutaka OGAWA

Department of Electronics Engineering, Faculty of Engineering,
Hokkaido University, Sapporo 060 Japan

This paper deals with joint optimization of receiver filters and a DIR in a QAM transmission system employing a 2-dimensional Viterbi detector. They are optimized with respect to an effective signal-to-noise ratio. First, the optimum receiver filter characteristics are obtained by using the calculus of variations argument. It is shown that the optimum receiver filters are composed of matched filters and transversal filters with infinite taps. Then, a pro-

cedure for obtaining the optimum DIR is described. Especially, the optimum DIR of length 2 is presented explicitly. Finally, numerical results are provided for a QAM system with a data rate of 12,000 bits/s. These numerical results show that the QAM system with the Viterbi detector performs much better than the conventional QAM system.

North American Radio Science Meeting and IEEE/AP-S International Symposium Université Laval, Cité universitaire Québec, Canada, June 2-6, 1980

Novel Circularly Polarized Antennas Combining a Slot with Parasitic Dipoles

Kiyoshiko ITOH and Takemi ADACHI

Department of Electronic Engineering, Faculty of Engineering

This paper deals with the design on antenna elements which provide good circular polarization and are suitable for broadcasting, communication, or maritime satellite antennas. The antennas designed here are of two types which are composed of one slot with one or two parasitic dipoles, respectively. There have been several circularly polarized antennas combining the slot and dipole antennas, all of which are treated almost qualitatively. This paper defines the coupling coefficient between electric and magnetic currents quantitatively in order to deal with the mutual coupling between the slot and the dipole which is placed above the slot and tilted to a certain angle with respect to the long direction of the slot. The technique of Reaction Matching is used for the formulation of the problem. One of advantages of these antennas is that a special circuit for circular polarization is not required.

North American Radio Science Meeting and IEEE/AP-S International Symposium Université Laval, Cité universitaire Québec, Canada, June 2-6, 1980

Signal Propagation in the Multimode Optical Waveguide As a Random Medium

Kiyohiko ITOH, Koichi TATEKURA and Hiroki ITOH

Department of Electronic Engineering, Faculty of Engineering

The usual theoretical investigations of mode coupling in the optical fiber or waveguide emphasize the scattering loss and the bandwidth of the impulse response. However, in the system design of optical communications, the baseband characteristics of the fiber are also

one of the most important factors. Nevertheless, its theoretical discussion has not been fully carried out.

This paper investigates the baseband response of the multimode optical fiber as a random medium. The result clarifies that the bandwidth in the steady state does not follow the law of the square root of length in the strict sense, although it may be a good approximation for low-modulating-frequency system. This paper adopts the Variational Method in order to analyze the multimode optical fiber.

Third International Carbon Conference,
Baden-Baden, West Germany,
June, 1980

**Effect of Alkali on the Devolatilization of Carbonaceous
Materials (I) Reaction Using NaOH and 3.5-
Dimethylphenol-Formaldehyde Resin**

Y. YAMASHITA and K. OUCHI

National Research Institute for Pollution and Resources

3.5-dimethylphenol-formaldehyde resin was carbonized with an addition of NaOH. As the amount of NaOH increases the evolution temperature of hydrogen gas is greatly lowered and the amount increases enormously. The tarry product almost disappeared due to the network formation reaction. In a high temperature region, the evolution of CO increases considerably with the addition of NaOH and this is related to the large decrease in weight brought about by CO evolution and the sublimation of reduced metallic Na.

Third International Carbon Conference,
Baden-Baden, West Germany,
June, 1980

**Effect of Alkali on the Devolatilization of Carbonaceous
Materials (II) Effect of Species of Carbonaceous
Materials and Alkalies**

K. OUCHI and Y. YAMASHITA

5 types of coals and petroleum asphalt were carbonized with 120 wt% of NaOH. Hydrogen evolution increased enormously and the temperature of maximum evolution was lowered by about 200~300°C. The amount of hydrogen was 60~100% of the hydrogen atoms involved in samples and NaOH. At higher temperatures than 700°C, CO also evolves enormously and this is caused by the reduction of Na₂O or Na₂CO₃ produced in the earlier step of carbonization to metal.

The effect of alkali species was also examined using 3,5-dimethylphenol-formaldehyde resin. Hydroxides of Li, Na, K, Sr and Ba react with the resin and enormous amounts of hydrogen and CO evolves. The reactivity is in the order of $\text{Li} < \text{Na} < \text{K}$ and $\text{Ca}, \text{Mg} \ll \text{Sr} < \text{Ba}$. The heavier metals react better. Carbonates did not evolve so much of hydrogen, but CO evolution was enormous.

The Second International Symposium
on Magnetic Resonance in Colloid and
Interface Science Menton, France,
June 25-July 7, 1979

ESR Study on Polymerization on Al_2O_3 Fresh Surface Produced by Fracture

N. KUROKAWA, M. TABATA and J. SOHMA

Alumina was fractured by a ball-mill at 77 K in the presence of ethylene monomer. ESR spectrum observed from the system after the milling was clearly different from that of the milled alumina. The paramagnetic species produced on the fresh surface by the fracture were scavenged by ethylene monomers and the ESR spectrum observed after the scavenging was identified to be one of the propagating radicals of polyethylene. The paramagnetic species of alumina, which were produced by γ -irradiation and showed a similar ESR spectrum, were not converted by contact with ethylene monomers. And the yield of polyethylene was found to increase with the increased time of milling.

An addition of an electron scavenger, such as TCNE, has little effect on the polymerization. The polyethylene molecules were not removed from the alumina surface by washing with hot toluene. Based on these experimental results it was concluded that the dangling bonds produced on the fresh surface of alumina by the fracture initiates the polymerization reaction of ethylene and the ends of polyethylene formed are chemically bonded to the alumina surface. Similar results were obtained in the experiment using propylene monomer.

19th Prague Microsymposium on Macromolecules "Mechanisms of Degradation and Stabilization of Hydrocarbon Polymers" July 9-12, 1979, Prague, Czechoslovakia

Spin Trapping Studies of Poly (Methyl methacrylate) Degradation in a Solution

Masayoshi TABATA and Junkichi SOHMA

Free radicals produced either by γ or ultrasonic irradiation of poly (methyl methacrylate) (PMMA) in a benzene solution were stabilized by spin trapping; they were identified by analysis of ESR spectra of the trapped radicals (the spin adducts).

The radical species identified after γ -irradiation were methyl, ester ($\cdot\text{COOCH}_3$), a pair of the chain scission radicals, $\sim\text{CH}_2\text{C}\cdot(\text{CH}_3)(\text{COOCH}_3)$ and $\cdot\text{CH}_2\text{-C}(\text{CH}_3)(\text{COOCH}_3)\sim$, and phenyl radical originating from the solvent. The chain scission radicals were also detected by spin trapping after ultrasonic irradiation of the benzene solution.

Taking account of the difference in the trapping rate for two spin trapping agents, 2, 4, 6-tri-*t*-butylnitrosobenzene (BNB) and penta-methyl-nitrosobenzene (PMNB), the radical species trapped by PMNB are assumed to be precursors of those trapped by BNB.

Based on the radical species found by the spin trapping method, plausible degradation processes for PMMA in benzene solution are proposed.

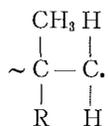
19th Prague Microsymposium on Macromolecules "Mechanisms of Degradation and Stabilization of Hydrocarbon Polymers" July 9-12, 1979, Prague, Czechoslovakia

ESR Evidence of Indirect Main-Chain Scissions in Poly (Methyl methacrylate)

Junkichi SOHMA and Masayoshi TABATA

It was found that free radicals of poly (methyl methacrylate) (PMMA) were formed by an addition of the spin trapping agent, 2, 6-di-chloro-nitrosobenzene (DCNB), to a PMMA-benzene solution. This PMMA radical was detected by the spin adduct with DCNB.

It was identified as a chain scission radical



by the analysis of the ESR spectrum and experiments using samples of PMMA deuterated either in the α -methyl or in the ester methyl group. Since DCNB is known to abstract hydrogen from other molecules, the main chain scission of PMMA caused by the action of DCNB is an indirect process resulting from a β -scission of the PMMA radical after a methylene hydrogen has been abstracted.

International Seminar on Electrons at
Low Temperatures April 17-19, 1980
Nieborów, Poland

Electrons Produced by Triboelectricity of Polymers and Their Trapping Sites at Low Temperatures

Junkichi SOHMA

It is well known that polymeric materials are readily electrically charged by friction (triboelectricity). Polypropylene, which were negatively charged by friction with metal, had an excess of electrons. ESR study was carried out for the negatively charged polypropylene. No ESR spectrum of trapped electrons was observed from the fractured polypropylene having an excess of electrons, but ESR spectra from the mechano-radicals were observed. Analysis of the decay behavior of the mechano-radicals in connection with the discharge curve suggested that the excess electrons were trapped by the mechano-radicals to form anions at low temperatures.

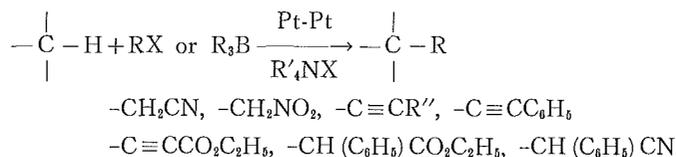
Symposium on Selective Electroorganic
Synthesis, 14th Research Conference,
Sanda, Japan, April 14-18, 1980

Electrochemical C-C Bond Forming Reaction Using Alkyl Halides or Trialkylborane

Masao TOKUDA

Department of Chemical Process Engineering

New electrochemical reactions for carbon-carbon bond formation using alkyl halides and trialkylboranes were successfully carried out. Electrolysis of a substrate containing an acidic hydrogen in the presence of alkyl halide or trialkylborane gave the corresponding alkylated product in a good yield. Tetraalkylammonium halide as a supporting electrolyte and platinum plate electrodes as a cathode and an anode were usually effective in our reactions.



These electrochemical alkylations using trialkylborane are of synthetic interest, firstly because there was no difficulty in introducing secondary alkyl groups as well as primary alkyl groups. Secondly, more than one alkyl group of trialkylborane, all three in some cases, were used for alkylation although only one alkyl group alone is used in usual chemical reactions of trialkylborane. Thirdly, the transfer of alkyl group from trialkylborane proceeded through a retention of a configuration.

IUPAC 26th International Symposium
on Macromolecules, Sept. 17-21, 1979
Mainz, Federal Republic of Germany

Kink Bands in Poly(vinylidene Fluoride)

Yasuhiro TAKAHASHI*, Hiroyuki TADOKORO*
and Akira ODAJIMA

X-ray diffuse streak scatterings were observed on the fiber diagrams of modifications I and II of poly(vinylidene fluoride), after drawing followed by annealing at fixed lengths. Such streak scatterings were interpreted in terms of kink bands.

The kink band of modification II is mainly formed by the flip-flop motion between TGT \bar{G} and T \bar{G} TG confirmations during the heat treatment under the high tension. The structure of the kink band is described by stacking four kinds of layer structures which consist of a monomeric unit (-CH₂•CF₂-).

The molecular chain in modification I takes essentially the planar zigzag conformation. Therefore, the kink band of modification I should be formed by introducing the gauche bonding (G or \bar{G}) into the trans bonding (T). This is considered to be formed by a shear stress applied to the crystallite during the deformation process, which may be closely associated with a kind of martensitic transformation from modification II to I.

* Department of Polymer Science, Faculty of Science, Osaka University, Toyonaka, Osaka 560.

Seventh International Conference on
MHD Electrical Power Generation
Cambridge, Massachusetts, U.S.A. June
16-20, 1980

Performance Improvement of MHD Generator by Transversally Shaped Distribution of Magnetic Inductions

Yasutomo OZAWA, Naoyuki KAYUKAWA and Yoshiaki AOKI
Energy Conversion Research Institute

Effects of transversally shaped configuration of the applied magnetic induction upon the output performance of MHD generators were investigated. About a 30 percent increase in the output power density was evaluated even in the case of relatively small size of an oil-fired MHD channel with the magnetic induction of 2.65 Tesla.

At the load matching condition, the output power density for the case of coal-fired commercial size MHD generators was improved by a factor of 200 percent under the assumed diffuse mode. About a 100 percent power increase was obtained even when light load conditions were used in order to keep the maximum local current density below the critical value of the current density to avoid the onset of transverse arcing. Also, no power saturation characteristics against the magnetic induction appeared even in the above mentioned "forced diffuse conduction mode". Preliminary experiments were performed using A-N₂-K plasma and exhibited encouraging results for the present proposal.

Third International Congress of Quantum Chemistry, October 29-November 3, 1979, Kyoto, Japan

ESR Study on γ -Irradiated Methanol Glass Produced by Vapour Condensation Method

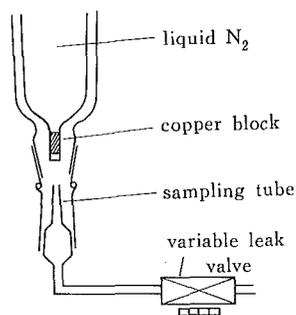
K. OHNO, S. KOMURA, T. SUMIYOSHI and M. KATAYAMA
Faculty of Engineering, Hokkaido University
Sapporo 060 Japan

Structural phase effects on the yield of trapped electrons in methanol solids irradiated by ionizing radiation were investigated. To obtain the solids, we made use of the vapour condensation method developed by Seki et al. The apparatus used in this investigation is shown in the figure below. Four types of samples were obtained and observed by ESR after ⁶⁰Co γ -ray irradiation.

(a) Transparent fragments were collected after crushing the sample deposited with both transparent and opaque layer; (B) The opaque ones were collected in the same way as (A);

(C) The whole ones contained both crushed transparent and opaque pieces; and (D) Transparent layer obtained by ceasing of deposition before the appearance of the polycrystalline layer. The samples containing transparent fragments give a triplet spectrum due to $\cdot\text{CH}_2\text{OH}$ superimposed on a singlet which can be assigned to trapped electrons.

The vapour condensation method seems to be a very powerful method to investigate phase effects on radiolysis of solids the phase of which is difficult to regulate by use of other methods.



4th International Conference on Ellipsometry; August 20-22, 1979, Lawrence Berkeley Laboratory, University of California, Berkeley, California, USA.

Intensity-Following Ellipsometry of Passive Films on Iron

Rokuro NISHIMURA*, Kiyokatsu KUDO* and Norio SATO

Electrochemistry Laboratory, Faculty of Engineering,
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Structures of passive films on iron formed by a two-step passivation method in acidic and neutral phosphate solutions were investigated by means of an intensity-following ellipsometry combined with a cathodic reduction technique.

The passive films thus formed were generally composed of a barrier layer and a deposit layer with each different optical constant. In pH below 5.5 the barrier layer was bi-layered, and below pH 2 the outer deposit layer was dissolved away. The total thickness of the film at a constant overpotential increased with the solution pH, but the thickness of the barrier layer was nearly constant irrespective of the pH.

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International Conference on "Non-Traditional Approaches to the Study of the Solid-Electrolyte Interface"; September, 1979, Snowman, Colorado, USA.

Ellipso-Reflectometry at Nickel in Sulphuric Acid Solutions

by K. E. HEUSLER*, and T. OHTSUKA

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A method was established to drive the optical properties of a substrate metal and a thin film on its surface by measuring the intensities at three directions of polarization after reflection of incident monochromatic light polarized linearly. Measurements were performed with nickel in acid sulphate solutions at pH 0.1, 0.9, and 1.6. The following conclusions on anodic passivation films of nickel are drawn from the experimental results: The state of oxidation increases continuously as the potential becomes more positive. The state of hydration grows as the potential becomes more negative and the pH value becomes larger. When a cathodic potential is applied to the passivated nickel, the kinetics of activation is characterized by a fast reduction and hydration of the non-stoichiometric oxide formed at positive potentials, followed by a slow dissolution of the resulting nickel (II) hydroxide. The spectrum of the complex refractive index in the region $1.4 \leq k\nu/ev < 4.8$ for a steady-state passivation film is characteristic of a partly hydrated semiconducting nickel oxide.

Fischer Symposium, October 4-5, 1979,
Institute of Physical Chemistry and
Electrochemistry, University of Karlsruhe,
Karlsruhe, West Germany

Ion Rectification and Corrosion Inhibition Induced by Bipolar Charges Fixed on Precipitate Films

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This paper presents a new mechanism of corrosion inhibition of metals in which the fixed charge on corrosion product precipitate films plays an important role. The ion-selective effect produced by the fixed charge in precipitate surface films either retard or accelerate the migration of aggressive ions from the environments to the metal surface. If the precipitate

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film is of bipolar nature, the anodic current of metal dissolution is significantly reduced owing to the ionic current rectification effect of bipolar membrane.

The Second USSR-JAPAN Corrosion
Seminar, October 23-26, 1979, Tokyo,
JAPAN.

Mechanism of Homogeneous and Heterogeneous Anodic Dissolution of Metals

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This key note lecture presents selective but coherent approaches to understand the present state of knowledge of anodic metal dissolution. There are four different states of metal dissolution; the active, the passive, the transpassive, and the brightening states. The metal dissolution mechanism depends on the dissolution state ranging from the dissolution at the film-free metal surface in the active state to the dissolution of film-covered surfaces in the passive, transpassive, and brightening states. Heterogeneous dissolution results when more than one state are formed at different sites on the metal surface. It is noted that there is a critical node of inhomogeneities or inhomogeneous perturbations beyond which local dissolution is initiated and progresses stably.

Second IIM International Symposium
on Hydrogen in Metals; November
26-29, 1979, Minakami Spa, Gunma
Prefecture, JAPAN

H₂S-Catalyzed Hydrogen Absorption in Iron

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Hydrogen adsorption in iron in the presence of H₂S was studied using an electrochemical hydrogen permeation membrane cell in weakly acidic acetate solutions. The selectivity factor for adsorbed hydrogen entering into the metal or forming hydrogen molecules was determined as a function of the electrode potential and H₂S concentration. It appears that the electrochemical combination route $H_{ad} + H^+ + e \rightarrow H_2$ predominates over the chemical combination. The adsorption of H₂S gives rise to the formation of (FeS)_{ad}, which will constitute the catalytic site for hydrogen absorption,

Third International Conference on
Phonon Scattering in Condensed Mat-
ters, Rhode Island, New York, U.S.A.,
August 26-30, 1979

Absorption of Surface Phonons by Adsorbed Helium System on an Inhomogeneous Surface

T. NAKAYAMA* and F. W. SHEARD**

Considerable interest has been paid to the dynamics of adsorbed atoms on a solid surface, particularly light atoms where quantum effects are expected to be important. The quantum states of a single helium atom adsorbed on a static ideal surface have been studied in detail. More recently the interaction of an acoustic surface wave (ASW) with a gas of noninteracting mobile adsorbed helium atoms has been analysed. However, except at very low surface coverages, interactions between helium atoms play an important role in determining the characteristics of the adsorbed layer.

In this paper we propose the use of high-frequency ASW to study the dynamic properties of adsorbed helium atoms in films of one or two monolayer thickness. The physical content of the model is that certain helium atoms may tunnel between localized potential minima and the energy splitting E between the two lowest levels varies randomly from site to site.

Third International Conference on the
Chemistry and Uses of Molybdenum.
(Aug. 19-23, 1979, Ann Arbor Michigan,
U.S.A.)

Anisotropic Properties of Molybdenum Disulfide Single Crystal Catalyst

Ken-ichi TANAKA and Toshio OKUHARA***

Isomerization and/or hydrogen exchange reaction through alkyl intermediates proceeds predominantly on the edge surface of an MoS_2 crystal, but the isomerization via carbonium ion intermediates occurs on the MoS_2 basal plane. Some of the reactions taking place on the edge surface have an induction time, and systematic studies on the edge surface suggest that the induction time may be caused by the rearrangement of active sites during which the barrier to rotational motion of intermediates becomes low.

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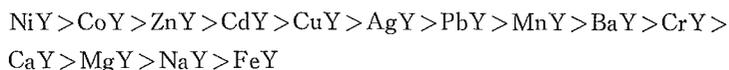
Symposium on "Novel Methods of Metal and Heteroatom Removal", 179th American Chemical Society National Meeting, Houston, March 24, 1980

The Catalytic Desulfurization of Organic Sulfur Compounds over Zeolite Catalysts

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The catalytic dehydrosulfurization of ethanethiol and hydrodesulfurization of thiophene over zeolite catalysts were investigated by the use of the pulse reactor.

The order of the initial activity of metal-ion exchanged Y zeolite (MeY) catalysts in the dehydrosulfurization of ethanethiol at 400°C was as follows:



The volcano shape order was observed between the catalytic activity for the dehydrosulfurization of ethanethiol and the electronegativity χ of metal ion in the catalysts.

The catalytic activity of sodium zeolite was dependent on the types of zeolites (NaX, NaY and NaA) and the order of the catalytic activity was $\text{NaX} > \text{NaY} > \text{NaA}$. Hydrogen Y zeolite (HY) also showed high catalytic activity. The catalytic activity of HY for the dehydrosulfurization of ethanethiol decreased with an increase of the calcination temperature of the catalyst as well as that of the dealkylation of cumene.

The reduced metal Y zeolites such as CoY and NiY showed high catalytic activity for the hydrodesulfurization of thiophene. The catalytic activity of reduced metal Y zeolites decreased with an increase of the pulse number but the catalyst deactivation against the pulse number was improved with the increase of the calcination temperature of the catalyst.

The Fifth International Conference on Zeolites, Naples, Italy, June 2-6, 1980

A Theoretical Study of the Site Selectivity of Transition Metal Ions in Dehydrated Zeolite A

Masahiro NITTA, Kiyoshi OGAWA and Kazuo AOMURA
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A theoretical interpretation is given for the site selectivity of Mn^{2+} , Co^{2+} , Fe^{2+} , Ni^{2+} , and Zn^{2+} ions in zeolite A by the calculation of the cation-lattice interaction energy. These cations

preferentially occupy the six-membered oxygen ring site, but the last incoming ions prefer the eight-membered oxygen ring site.

The Seventh International Congress
on Catalysis, June 30–July 4, 1980

Olefin Metathesis Reaction over Supported Molybdenum Oxide Catalyst

Katsumi TANAKA*, Koshiro MIYAHARA* and Ken-ichi TANAKA

Metathesis reaction was studied on a novel catalyst on which neither hydrogen scrambling nor isomerization of olefins proceed appreciably. By using labeled olefins, it was shown that productive metathesis and degenerate metathesis occurred simultaneously, and that the ratio of these two types of metathesis reactions depended on supporting oxides. Furthermore, it was found that the metathesis on this catalyst shows entire stereo selectivity, that is *cis*-but-2-ene- d_8 + *cis*-but-2-ene- d_0 gives *cis*-but-2-ene- d_4 and *trans*-but-2-ene- d_8 + *trans*-but-2-ene- d_0 yields *trans*-but-2-ene- d_4 preferentially.

23rd SPIE's International Technical
Symposium, August 29–30, 1979, San
Diego, California, U.S.A

Spatial Coherence Control of a Laser Beam by Ultrasonic Waves and Its Applications

Yoshihiro OHTSUKA

This article reviews the recent research on optical coherence modification by ultrasonic waves. The coherence condition for illumination can be modified almost at will by controlling an r.f. electric potential across the ultrasonic transducer.

A progressive ultrasonic wave works in such a way as to change the coherence factor periodically in space, as long as the ultrasonic wave can be treated as a pure phase grating upon an incident light beam. Some applications are discussed of speckle reduction in optical information processing and of two-point resolution under partially coherent illumination. Regarding both applications, considerable improvements are recognized.

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North-American Radio Science Meeting and IEEE/AP·S International Symposium, Quebec, Canada, June 2-6, 1980

Modal Interference of Laser Light Emitted From an Optical Fiber

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The average intensity and average contrast distributions of the far-field interference patterns of laser light emitted from the end face of optical fibers are theoretically studied with consideration that mode conversion takes place in the optical waveguide. The optical fiber considered here is a multimode graded-index fiber having random fluctuations of the refractive index in the core as well as in the cladding. The index fluctuations are assumed to obey a normal probability distribution so that the fourth moment of the radiation field can be obtained in terms of the second moment. Using the properties for the index fluctuations, average contrast defined as a normalized deviation of speckle intensity variations is calculated within the second-order approximation of perturbation. The results show that the average contrast decays with lateral distance in the far-field plane and its tendency is rather sharp at the off-axis when the fluctuation scale of the refractive index becomes small.

International Seminar on Electrons at Low Temperatures, Nieborów, Poland, April 17-19, 1980

Trapped Electron Structure as Studied at Low Temperatures

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Studies on the nature of electrons in rigid organic materices by means of 4.2 K γ -irradiation technique are auto-reviewed. The presentation includes (1) a small spectral shift observed from nonpolar alkane glasses and MTHF glass when warmed from 4.2 to 77 K, (2) a general feature of the electron spectra (apparent two peaks) observed from alcohols, and (3) time-dependent spectral evolution observed from ethanol and 1-propanol upon warming to 77 K. These observations will lead to conclusion that two distinct trapped electron structures are present in alcohol glasses.

The 11-th Symposium on Mathematical Physics, Torun, Poland, December 4-7, 1979

**On a Differential Geometrical Consideration of the
Relation Between Neyman-Pearson's Test
Criterion and Wald's test Criterion**

Yoshiharu SATO

A differential geometrical structure of the statistical parameter space are discussed. The geometrical properties and quantities of the parameter space have been considered to be closely connected with a statistical inference by Efron and others. Some concrete geometrical structures of the parameter space in the exponential family of distribution are offered and the test of the hypothesis is discussed from a geometrical point of view in connection with a secondorder efficiency.

Consequently, it is shown that the geometrical approach will clarify the relation among various statistics, for example, Wald's test criterion, Neyman-Pearson's test criterion and so on, which are important in a statistical inference.

Fifth World Congress on the Theory of Machines and Mechanisms, Montreal, Canada, July 8-13, 1979

Continuum Mechanics of Asymmetric Stress Fields

Masaru SHIMBO and Demetrio J. MANGERON

A geometrical formulation of asymmetric features in plasticity is outlined within the framework of the non-Riemannian theory of plasticity. A material body is assumed to be an aggregation of small material elements, each of which can deform and rotate freely, so that asymmetric features must be considered. The law of friction between antisymmetric parts of stress and strain is further assumed. It reveals that a certain distribution of asymmetric stress entails the gradient of volumetric strain. The effect of dilatancy which plays an important role in granular media can be explained in connection with the non-Riemannian theory of plasticity. In the analysis of the flow of viscoelastic materials, the mutual interference of viscous and elastic parts of deformation is taken into account, affording a possible analytical representation of the tubular pinch effect in hydrodynamics.