



# HOKKAIDO UNIVERSITY

Title	SCIENTIFIC PUBLICATIONS By JURO HORIUTI
Citation	JOURNAL OF THE RESEARCH INSTITUTE FOR CATALYSIS HOKKAIDO UNIVERSITY, 27(2), 49-61
Issue Date	1979-09
Doc URL	<a href="https://hdl.handle.net/2115/25059">https://hdl.handle.net/2115/25059</a>
Type	departmental bulletin paper
File Information	27(2)_P49-61.pdf



## SCIENTIFIC PUBLICATIONS

By

**JURO HORIUTI**

### (A) Publications in European Languages

- 1) J. Horiuti, A Relation between Orthobaric Densities—I, *Bull. Chem. Soc. Japan*, **1**, 189 (1926).
- 2) J. Horiuti, A Relation between Orthobaric Densities—II, *Bull. Chem. Soc. Japan*, **2**, 213 (1927).
- 3) J. Horiuti, A Relation between Orthobaric Volumes and Temperature, *Sci. Papers, Inst. Phys. Chem. Research, Tokyo*, **15**, 89 (1931).
- 4) J. Horiuti, On the Solubility of Gas and Coefficient of Dilatation by Adsorption, *Sci. Papers, Inst. Phys. Chem. Research, Tokyo*, **17**, 125 (1931).
- 5) J. Horiuti, Bemerkung zur Bestimmung der Lösungswarme von Gasen, *Z. Elektrochem.*, **39**, 20 (1933).
- 6) J. Horiuti, Zusammenhang Zwischen Löslichkeit und Diffusions-Koeffizient von Gasen in Flüssigkeiten, *Z. Elektrochem.*, **39**, 22 (1933).
- 7) J. Horiuti and M. Polanyi, A Catalyzed Reaction of Hydrogen with Water, *Nature*, **132**, 819 (1933).
- 8) J. Horiuti and M. Polanyi, Catalytic Reaction of Hydrogen with Water and the Nature of Overvoltage, *Nature*, **132**, 931 (1933).
- 9) J. Horiuti, Zur Schwingungsstruktur im Tetrachlorokohlenstoffspektrum, *Z. physik.*, **84**, 380 (1933).
- 10) J. Horiuti, G. Ogden and M. Polanyi, Catalytic Replacement of Halogen in Benzene, *Trans. Faraday Soc.*, **30**, 663 (1934).
- 11) J. Horiuti and M. Polanyi, Direct Introduction of Deuterium into Benzen, *Nature*, **134**, 847 (1934).
- 12) J. Horiuti and M. Polanyi, On the Mechanism of Ionization of Hydrogen at a Platinum Electrode, *Mem. Proc, Manchester Lit. Phil. Soc.*, 47 (1933–34).
- 13) J. Horiuti and L. Szabo, Reaction of Heavy Water with Metallic Sodium, *Nature*, **133**, 327 (1934).
- 14) B. Cavanagh, J. Horiuti and M. Polanyi, Enzyme Catalysis of the Ionization of Hydrogen, *Nature*, **133**, 797 (1934).

## J. HORIUTI

- 15) J. Horiuti and M. Polanyi, Catalytic Interchange of Hydrogen between Water and Ethylene and between Water and Benzene, *Nature*, **134**, 377 (1934).
- 16) J. Horiuti and M. Polanyi, Exchange Reaction of Hydrogen on Metallic Catalysts, *Trans. Faraday Soc.*, **30**, 1164 (1934).
- 17) J. Horiuti and G. Okamoto, Isotopic Shift of Water by Distillation, *Bull. Chem. Soc. Japan*, **10**, 503 (1935).
- 18) J. Horiuti and M. Polanyi, Grundlinien einer Theorie der Protonübertragung, *Acta Physicochim. URSS*, **2**, 505 (1935).
- 19) G. Okamoto, J. Horiuti and K. Hirota, Interchange Equilibrium between Acetylene and Heavy Water, *Bull. Chem. Soc. Japan*, **11**, 349 (1936).
- 20) J. Horiuti and Y. Sakamoto, Isotopic Interchange Reaction between Chloroform and Water, *Bull. Chem. Soc. Japan*, **11**, 627 (1936).
- 21) J. Horiuti and G. Okamoto, On the Nature of Overvoltage and Electrolytic Separation of Hydrogen Isotopes, *Sci. Papers, Inst. Phys. Chem. Research, Tokyo*, **28**, 231 (1936).
- 22) J. Horiuti, K. Hirota and G. Okamoto, Application of Transition State Method to the Heterogeneous Reaction on Hydrogen Electrode, *Sci. Papers, Inst. Phys. Chem. Research, Tokyo*, **29**, 223 (1936).
- 23) J. Horiuti and G. Okamoto, Note on the Mechanism of Catalytic Interchange of Hydrogen with Water and Alcohol, *Trans. Faraday Soc.*, **32**, 1942 (1936).
- 24) K. Hirota and J. Horiuti, Relative Catalytic Activity of Several Metals for the Isotopic Interchange Reaction, *Sci. Papers, Inst. Phys. Chem. Research, Tokyo*, **30**, 151 (1936).
- 25) J. Horiuti and G. Okamoto, Determination of the Number of Interchangeable Hydrogen Atoms in Complex Salts, *Sci. Papers, Inst. Phys. Chem. Research, Tokyo*, **31**, 205 (1937).
- 26) J. Horiuti and G. Okamoto, The Mechanism of the Hydrogen Electrode Process—I. The Catalytic Mechanism, *Bull. Chem. Soc. Japan*, **13**, 216 (1938).
- 27) J. Horiuti, On the Statistical Mechanical Treatment of the Absolute Rate of the Chemical Reaction, *Bull. Chem. Soc. Japan*, **13**, 210 (1938).
- 28) K. Hirota and J. Horiuti, The Classical Statistical Mechanical Formulation of the Absolute Rate of Reaction in General Chemical System, *Sci. Papers, Inst. Phys. Chem. Research, Tokyo*, **34**, 1174 (1938).
- 29) K. Hirota and J. Horiuti, The Mechanism of the Hydrogen Electrode Process—II. The Electrochemical Mechanism. The Existence

*Scientific Publications*

- of Hydrogen Molecule Ions on the Surface of the Electrode, Bull. Chem. Soc. Japan, **13**, 228 (1939).
- 30) J. Horiuti and M. Ikusima, The Mechanism of the Hydrogen Electrode Process on Platinum, Proc. Imp. Acad., Tokyo, **15**, 39 (1939).
  - 31) J. Horiuti and T. Kwan, The Mechanism of the Contact Hydrogenation of Carbonyl Groups in the Presence of Metallic Catalysts, Proc. Imp. Acad., Tokyo, **15**, 105 (1939).
  - 32) K. Hirota and J. Horiuti, An Electrical Phenomenon of a Palladium Filament occluding Hydrogen, Proc. Imp. Acad., Tokyo, **15**, 10 (1939).
  - 33) J. Horiuti, On the Mechanism of Hydrogen Electrode Process, Sci. Papers, Inst. Phys. Chem. Research, Tokyo, **37**, 274 (1940).
  - 34) J. Horiuti, S. Toraishi and I. Outi, Determination of the Charge and the Magnitude of Colloidal Particle by means of Flexible Float, J. Res. Inst. Catalysis, Hokkaido Univ., **1**, 1 (1948-50).
  - 35) J. Horiuti, A Method of Statistical Mechanical Treatment of Equilibrium and Chemical Reactions, J. Res. Inst. Catalysis, Hokkaido Univ., **1**, 8 (1948-50).
  - 36) J. Horiuti and K. Tanabe, On the Solubility of Prussic Acid for Water, J. Res. Inst. Catalysis, Hokkaido Univ., **1**, 117 (1948-50).
  - 37) J. Horiuti and T. Nakamura, The Electrolytic Separation Factor of Tritium, J. Chem. Phys., **18**, 395 (1950).
  - 38) J. Horiuti and K. Tanabe, The Exchange Reaction of  $\text{Cl}^{36}$  between Chloroform and Aqueous Hydrochloric Acid; the Decomposition Mechanism of Chloroform, Proc. Japan Acad., **27**, 404 (1951).
  - 39) J. Horiuti, T. Keii and K. Hirota, Mechanism of Hydrogen Electrode of Mercury — "Electrochemical Mechanism", J. Res. Inst. Catalysis, Hokkaido Univ., **2**, 1 (1951-3).
  - 40) J. Horiuti and T. Nakamura, Electrolytic Separation Factor of Tritium, J. Res. Inst. Catalysis, Hokkaido Univ., **2**, 73 (1951-3).
  - 41) J. Horiuti and A. Mituya, Determination of the Rate of Hydrogen Electrode Process on Mercury Cathode at Higher Electrode Potential, J. Res. Inst. Catalysis, Hokkaido Univ., **2**, 79 (1951-3).
  - 42) S. Enomoto and J. Horiuti, Determination of Stoichiometric Number of Ammonia Synthesis Reaction, J. Res. Inst. Catalysis, Hokkaido Univ., **2**, 87 (1951-3).
  - 43) J. Horiuti, T. Keii and A. Mituya, Velocity of Hydrogen Evolution at Low Overvoltage: Answer to Comments of Bockris, J. Res. Inst. Catalysis, Hokkaido Univ., **2**, 107 (1951-3).
  - 44) J. Horiuti and K. Tanabe, The Exchange Reaction of Cl between

J. HORIUTI

- Carbon Tetrachloride and Aqueous Chloride Solution, Proc. Japan Acad., **28**, 127 (1952).
- 45) J. Horiuti and K. Tanabe, The Effect of Oxygen in the Exchange Reaction of  $\text{Cl}^{36}$  between Chloroform and Aqueous Chloride Solution, Proc. Japan Acad., **28**, 136 (1952).
  - 46) S. Enomoto and J. Horiuti, Experimental Determination of Overall and One-Direction Rate of Ammonia Synthesis Reaction, Proc. Japan Acad., **28**, 493 (1952).
  - 47) S. Enomoto and J. Horiuti, Stoichiometric Number of Ammonia Synthesis Reaction, Proc. Japan Acad., **28**, 499 (1952).
  - 48) J. Horiuti, Stoichiometric Number and Universal Kinetic Law in the Neighbourhood of Equilibrium—I, Proc. Japan Acad., **29**, 160 (1953).
  - 49) J. Horiuti and S. Enomoto, Stoichiometric Number and Universal Kinetic Law in the Neighbourhood of Equilibrium—II, Proc. Japan Acad., **29**, 165 (1953).
  - 50) J. Horiuti and K. Tanabe, Photochemical Promotion of Exchange Reaction of Chlorine between Chloroform and Carbon Tetrachloride and Aqueous Chloride Solution, Proc. Japan Acad., **29**, 254 (1953).
  - 51) J. Horiuti, K. Tanabe and Y. Watanabe, Research on Catalysis by means of Radiochlorine  $\text{Cl}^{36}$ —I. Treatment with Radioactive Hydrogen Chloride, J. Res. Inst. Catalysis, Hokkaido Univ., **3**, 1 (1953-5).
  - 52) J. Horiuti, K. Tanabe, Y. Watanabe and K. Tanaka, Research on Catalysis by means of Radiochlorine  $\text{Cl}^{36}$ —II. State of Chlorine Deposited on Catalysts, J. Res. Inst. Catalysis, Hokkaido Univ., **3**, 10 (1953-5).
  - 53) J. Horiuti, Hydrogen Intermediates on Catalysis and Electrodes—I. Fundamental, J. Res. Inst. Catalysis, Hokkaido Univ., **3**, 52 (1953-5).
  - 54) J. Horiuti, K. Tanabe and K. Tanaka, Chlorine Exchange Reaction between Chloroform and Aqueous Chloride Solution, J. Res. Inst. Catalysis, Hokkaido Univ., **3**, 119 (1953-5).
  - 55) J. Horiuti, K. Tanabe and K. Tanaka, The Mechanism of the Decomposition of Chloroform, J. Res. Inst. Catalysis, Hokkaido Univ., **3**, 147 (1953-5).
  - 56) S. Enomoto, J. Horiuti and H. Kobayashi, Determination of Stoichiometric Number of Ammonia Synthesis Reaction at 29.5 Atm., J. Res. Inst. Catalysis, Hokkaido Univ., **3**, 185 (1953-5).
  - 57) J. Horiuti and H. Sugawara, Stoichiometric Number of the Hydrogen Electrode Process on Nickel. Comment on a Paper of Bockris and Potter, J. Res. Inst. Catalysis, Hokkaido Univ., **4**, 1 (1956-7).

*Scientific Publications*

- 58) J. Horiuti, Catalytic Mechanism of the Hydrogen Electrode Process and Theory of Reaction Rate, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **4**, 55 (1956-7).
- 59) J. Horiuti and H. Kita, On the Sorption of Nitrogen on Commercial Ammonia Synthesis Catalyst, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **4**, 132 (1956-7).
- 60) J. Horiuti and K. Tanaka, Synthesis of Prussic Acid — 15. Study of Reaction Mechanism by means of Radioactive Carbon, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **4**, 165 (1956-7).
- 61) J. Horiuti, Stoichiometrische Zahlen und die Kinetik der chemischen Reaktionen, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **5**, 1 (1957).
- 62) J. Horiuti, T. Keii, M. Enyo and M. Fukuda, On the Law of Eyring *et al.* on Hydrogen Electrode Reactions, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **5**, 40 (1957).
- 63) J. Horiuti and I. Toyoshima, Mechanism of Catalyzed Decomposition of Ammonia in the Presence of Doubly Promoted Synthetic Catalyst —I. Observation of the Decomposition Rate, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **5**, 120 (1957).
- 64) J. Horiuti and T. Nakamura, Stoichiometric Number and the Theory of Steady Reaction, *Z. physik. Chem. Neue Folge*, **11**, 358 (1957).
- 65) J. Horiuti, General Theorem on the Relation between Rate Constants and the Equilibrium Constant, *Z. physik. Chem. Neue Folge*, **12**, 321 (1957).
- 66) J. Horiuti, A Theorem on the Relation between Rate Constant and Equilibrium Constant, *Advances in Catalysis*, **IX**, 339 (1957).
- 67) J. Horiuti, Surface Activity of Hydrogen Intermediates of Catalyzed Hydrogenation and Hydrogen Evolution Reaction, *Proc. II<sup>nd</sup> Intern. Congr. Surface Activity*, p. 280 (1975).
- 68) J. Horiuti, Mechanismus der Wasserstoffelektrodenreaktion, *Z. phys. Chem. Neue Folge*, **15**, 162 (1958).
- 69) J. Horiuti and M. Katayama, Photochemical Reactions of Chloroform in the Presence of Aqueous Solution, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **6**, 44 (1958).
- 70) J. Horiuti and M. Katayama, On the Mechanism of Decomposition of Chloroform in Aqueous Solution and the Simultaneous Chlorine Exchange between Them., *J. Res. Inst. Catalysis, Hokkaido Univ.*, **6**, 57 (1958).
- 71) J. Horiuti and I. Toyoshima, Mechanism of Catalyzed Decomposition of Ammonia in the Presence of Doubly Promoted Synthetic Catalyst

## J. HORIUTI

- II. Analysis of Experimental Results for the Rate-Determining Step, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **6**, 68 (1958).
- 72) I. Toyoshima and J. Horiuti, Mechanism of Catalyzed Decomposition of Ammonia in the Presence of Doubly Promoted Synthetic Catalyst —III. Hysteresis of the Decomposition Rate, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **6**, 146 (1958).
- 73) J. Horiuti and Y. Komobuchi, Corrosion of Nickel by Aqueous Alkali, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **6**, 92 (1958).
- 74) J. Horiuti and Y. Komobuchi, Dependency on pH of Nickel Corrosion in Aqueous Solutions, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **6**, 197 (1958).
- 75) A. Matsuda and J. Horiuti, Tafel's Constant and Hydrogen Ion Concentration Dependence of Overvoltage in Hydrogen Evolution Reaction —I. Slow Discharge and Electrochemical Mechanisms, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **6**, 231 (1958).
- 76) J. Horiuti, Theory of Hydrogenation of Ethylene on Metallic Catalysts—I. Fundamentals of Analysis, *J. Res. Inst. Catalysis, Hokkaido Univ.* **6**, 250 (1958).
- 77) J. Horiuti, T. Sato and K. Ishizuka, Synthesis of Prussic Acid—XVI. Study on the Synthesis of Prussic Acid under Pressure, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **6**, 207 (1958).
- 78) J. Horiuti, Theory of Hydrogenation of Ethylene on Metallic Catalyst—II. Quantitative Determination of Characteristic Rate Functions,  $\bar{k}(s)$ 's of Constituent Steps  $s$ 's of the Associative Mechanism, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **7**, 163 (1959).
- 79) J. Horiuti and I. Matsuzaki, Theory of Hydrogenation of Ethylene on Metallic Catalyst—III. Theoretical Relations between Equilibrium Fraction, Deuterium Atomic Fraction and Partial Pressure of Hydrogen in Course of Catalyzed Hydrogenation of Ethylene with Deuterium in the Presence of Nickel Catalyst, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **7**, 187 (1959).
- 80) J. Horiuti and A. Matsuda, The Stoichiometric Number of Zinc Amalgam Electrode Reaction, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **7**, 19 (1959).
- 81) J. Horiuti, New Viewpoints in Chemical Kinetics, *Khimicheskaya Nauka i Promyshlennosti* **4**, 783 (1959), Lecture Note Translated into Russian by A. A. Lopatkin and V. D. Yagodovskii.
- 82) J. Horiuti, How to Find Rate Equation of Reverse Reaction? (in Russ.), *Problemy Fizicheskoi Khimii*, **2**, 39 (1959).

*Scientific Publications*

- 83) J. Horiuti and I. Toyoshima, Mechanism of the Catalyzed Synthesis of Ammonia, The Organization Committee of the 8th Mendeleev Conference on General and Applied Chemistry, (1959), p. 76.
- 84) J. Horiuti, Application of Isotopes in the Study of Hydrogen and Oxygen Electrode Reactions (in Russ.). The Organization Committee of the 8th Mendeleev Conference on General and Applied Chemistry, (1959), p. 150.
- 85) J. Horiuti and N. Takezawa, Stoichiometric Number of the Rate determining Step and the Mechanism of Catalyzed Ammonia Synthesis in the Presence of Commercial Iron Catalyst, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **8**, 127 (1960).
- 86) J. Horiuti and K. Hirota, Isotherm of Dissociative Adsorption of Hydrogen allowed for Repulsive Interactions among Adsorbed Atoms, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **8**, 51 (1960).
- 87) J. Horiuti, Correction to the Paper "Isotherm of Dissociative Adsorption of Hydrogen allowed for Repulsive Interactions among Adsorbed Atoms" by Horiuti and Hirota, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **8**, 167 (1960).
- 88) J. Horiuti and N. Takezawa, The Mechanism of Catalyzed Synthesis of Ammonia in the Presence of Doubly Promoted Iron Catalyst, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **8**, 170 (1960).
- 89) J. Horiuti, On the Heterogeneous Model of the Surface of Adsorbents, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **9**, 108 (1961).
- 90) J. Horiuti, Theoretical Isotherm of Hydrogen Chemisorption based on the Homogeneous Model of the Surface of Adsorbent Metal, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **9**, 143 (1961).
- 91) J. Horiuti, Activation Free Energy and Activation Energy as Determining Factors of Chemical Reaction Rate, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **9**, 211 (1961).
- 92) J. Horiuti, Mechanism of the Hydrogen Electrode Reaction, *Trans. Symposium on Electrode Processes*, edited by E. Yeager, John Wiley & Sons, Inc., (1961), p. 17.
- 93) J. Horiuti, Statistical Mechanical Analysis of Catalyzed Hydrogenation of Olefins and Associated Reactions in the Presence of Metallic Catalysis, *Actes du Deuxième Congrès International de Catalyse*, 1191 (1961).
- 94) J. Horiuti, Significance and Experimental Determination of Stoichiometric Number, *J. Catalysis*, **1**, 199 (1962).
- 95) J. Horiuti, K. Tanaka and T. Kodera, Stoichiometric Number of the

## J. HORIUTI

- Rate-Determining Step of Ammonia Synthesis on Iron Catalysts, Comment on the Papers of C. Bokhoven, M. J. Gorgels and P. Mars, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **10**, 1 (1962).
- 96) A. Matsuda and J. Horiuti, The Relation between Stoichiometric Number and Exchange Reaction, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **10**, 14 (1962).
- 97) M. Fukuda and J. Horiuti, Separation Factor of Deuterium on Platinum Hydrogen Electrode in Aqueous Sulfuric Acid, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **10**, 43 (1962).
- 98) J. Horiuti and M. Fukuda, A Theorem on Electrolytic Separation Factors, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **10**, 73 (1962).
- 99) J. Horiuti, Homogeneity or Heterogeneity of the Surface of Metallic Catalysts, *J. Intern. Union of Pure and Applied Chemistry*, **5**, 641 (1962).
- 100) J. Horiuti, A Simple Method of Statistical Mechanical Calculation of Adsorption Isotherm, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **11**, 55 (1963).
- 101) J. Horiuti and T. Toya, Entropy of Hydrogen Adatom on Nickel, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **11**, 84 (1963).
- 102) J. Horiuti, On the Catalytic Mechanism of Hydrogen Electrode Reaction, *J. Res. Inst. Catalysis*, **11**, 164 (1963).
- 103) J. Horiuti and T. Toya, Note on the Model of Metallic Adsorbent of Hydrogen, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **11**, 174 (1963).
- 104) J. Horiuti and T. Toya, Adsorption Isotherm and the States of Adsorption, (in Russ.), *Kinetika i Kataliz*, **4**, 3 (1963). *idem.*, (in Eng.), *J. Res. Inst. Catalysis, Hokkaido Univ.*, **24**, 159 (1976).
- 105) J. Horiuti, A. Matsuda, M. Enyo and H. Kita, Mechanism of Hydrogen Evolution Reaction, *The First Australian Conf. on Electrochem. Sydney—Hobart*, 13-20th Feb., (1963).
- 106) J. Horiuti and H. Kita, On the Law of Laidler, Glasstone and Eyring—I. Derivation from the Catalytic Mechanism of Hydrogen Electrode Reaction, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **12**, 1 (1964).
- 107) J. Horiuti and H. Kita, On the Law of Laidler, Glasstone and Eyring—II. Heterogeneous Reaction of Hydrogen, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **12**, 14 (1964).
- 108) J. Horiuti, K. Miyahara and I. Toyoshima, Characteristic Constant of Heterogeneous Reactions on Solid Metallic Catalysts, *Symposium on Physical Chem. of Processes on Solid Surfaces*, Madrid, 20-25th October, 1964, p. 143 (1965).

*Scientific Publications*

- 109) J. Horiuti and T. Toya, Theoretical Isotherm of Hydrogen Adsorption on Nickel—1, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **12**, 76 (1964).
- 110) J. Horiuti and H. Kita, Theoretical Investigation of the Hydrogen Electrode Reaction on (110)-, (100)- and (111)-Lattice Planes of Nickel, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **12**, 122 (1964).
- 111) J. Horiuti, Mechanism of Hydrogen Electrode Reaction, CITCE 1966 (not printed).
- 112) J. Horiuti and T. Toya, Chemisorbed Hydrogen, *Solid State Surface Science*, Marcel Dekker Co., New York (1969), Vol. 1, p. 1.
- 113) J. Horiuti, K. Miyahara and I. Toyoshima, Number of Seats of Heterogeneous Reaction on Metallic Catalysts, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **14**, 59 (1966).
- 114) J. Horiuti and T. Nakamura, On the Heterogeneous Catalysis, *Advances in Catalysis*, **17**, 1 (1967).
- 115) J. Horiuti and C. Lin, Adsorption Isotherm of Rare Gas on the Surface of its Own Bulk Liquid, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **16**, 395 (1968).
- 116) J. Horiuti and C. Lin, Theory of Multilayer Adsorption—Method of Surface Area Determination, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **16**, 411 (1968).
- 117) J. Horiuti and K. Müller, Electrolytic Separation Factors of Hydrogen on Nickel, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **16**, 605 (1968).
- 118) J. Horiuti, Remarks on the Treatment of Heterogeneous Catalysis, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **16**, 501 (1968).
- 119) J. Horiuti and K. Miyahara, Hydrogenation of Ethylene on Metallic Catalysts, *Standard Reference Data*, NSRDS-NBC 13 (1968).
- 120) J. Horiuti and K. Miyahara, Orientation to Effective Catalysts for Hydrogenation of Olefines, IV-ICC Moscow (1968).
- 121) J. Horiuti and T. Toya, Chemisorbed Hydrogen. *Solid State Surface Science*, **1**, 1 (1969).
- 122) J. Horiuti, Scientific Works of Juro Horiuti, (1969) (not printed).
- 123) J. Horiuti and K. Miyahara, Mechanism of Catalyzed Hydrogenation of Ethylene in the Presence of Metallic Catalysts, *Z. phys. Chem. Neue Folge*, **64**, 36 (1969).
- 124) J. Horiuti, Gas Evolution Reaction, *Physical Chemistry* Vol. 98, Chapter 6 (1970), ed. by H. Eyring, Academic Press, New York.
- 125) J. Horiuti and C. Lin, Method of Monolayer Capacity Determination of Catalysts, *Proc. Fifth Intern. Congr. on Catalysis* (1972), p. 573.
- 126) J. Horiuti, Unidirectional Rates of Reaction of Single Route, *J. Res.*

## J. HORIUTI

- Inst. Catalysis, Hokkaido Univ., **20**, 225 (1972).
- 127) J. Horiuti, Theory of Reaction Rates as Based on the Stoichiometric Number Concept, *Annals of the New York Academy of Sciences*, **213**, 5 (1973).
- 128) J. Horiuti, Early Days in Electrochemistry, *J. Res. Inst. Catalysis, Hokkaido Univ.*, **22**, 126 (1974).
- 129) J. Horiuti, Catalyzed Reactions by Solid Surfaces and Adsorption, *Second Intern. Conf. on Solid Surfaces*, (1974).

**(B) Publications in Japanese**

(List of Periodicals in Japanese and their Translations)

Denki Kagaku :	J. Electrochem.
Denki Kagaku no Shimpo :	Progress in Electrochem.
Iwanami Koza :	Iwanami Lectures
Kagaku Bunken-sho :	Summary of Chem. Literatures
Kagaku Kogyo :	Chem. Engineering
Kagaku Soho :	Chem. Reviews
Kagaku to Kogyo :	Chem. and Chem. Engineering
Kiso Kagaku :	Fundamental Chem.
Nippon Kagaku Kaishi :	J. Chem. Soc. Japan
Oyo Butsuri :	Applied Phys.
Rikagaku Kenkyusho Iho :	Sci. Papers, Inst. Phys. Chem. Res., Tokyo
Shokubai :	Catalyst

- 1) J. Horiuti, The Relation Between Molar Volumes of Liquid and Gas under their Co-existence, *Nippon Kagaku Kaishi*, **47**, 587 (1926).
- 2) J. Horiuti, The Relation between Molar Volumes of Liquid and Gas under their Co-existence, *Nippon Kagaku Kaishi*, **48**, 417 (1927).
- 3) J. Horiuti, The Relation between Orthobaric Volume and Temperature, *Rikagaku Kenkyusho Iho*, **10**, 95 (1931).
- 4) J. Horiuti, On the Solubility of Gases, *Rikagaku Kenkyusho Iho*, **7**, 119 (1928).
- 5) J. Horiuti, On the Solubility of Gases-2, *Rikagaku Kenkyusho Iho*, **9**, 697 (1930).
- 6) J. Horiuti, On the Solubility of Gases-3, *Rikagaku Kenkyusho Iho*, **10**, 374 (1931).

*Scientific Publications*

- 7) J. Horiuti, On the Solubility of Gases-4, *Rikagaku Kenkyosho Iho*, **11**, 55 (1932).
- 8) J. Horiuti, *Deuterium and the Isotope Chemistry*, *Kagaku Bunken-sho*, Iwanami Shoten, Publishers (1936).
- 9) J. Horiuti, Effect of Air on the Properties of Organic Solvents, *Nippon Kagaku Kaishi*, **53**, 47 (1932).
- 10) J. Horiuti and G. Okamoto, Theory of the Hydrogen Electrode Reaction, *Denki Kagaku*, **5**, 368 (1937).
- 11) J. Horiuti and K. Hirota, Electric Property of Palladium Wire with Absorbed Hydrogen, *Oyo Butsuri*, **8**, 20 (1939).
- 12) J. Horiuti, Theory of Chemical Reactions, Iwanami Koza, Iwanami Shoten, Publishers (1940).
- 13) J. Horiuti, On the Mechanism of Catalytic Reactions of Hydrogen, *Nippon Gakujutsu Shinkokai (Japan Society of Promoting Science)*, 13th Committee Lectures, **1**, 15 (1940).
- 14) J. Horiuti, The Electrodes, *Denki Kagaku no Shimpo.*, **6**, 9 (1939).
- 15) J. Horiuti, Developments of the Theory of Reaction Rates-1, *Kagaku Soho*, **2**, 91 (1941).
- 16) J. Horiuti, Developments of the Theory of Reaction Rates-2, *Kagaku Soho*, **6**, 137 (1944).
- 17) J. Horiuti, Mechanism of Catalytic Polymerization and Isomerization Reactions, *Shokubai*, **1**, 67 (1946).
- 18) J. Horiuti, On the Pressurized Polymerization, *Shokubai*, Vol. **1**, 95 (1946).
- 19) J. Horiuti, Statistical-Mechanical Theory of Heterogeneous Catalytic Reactions, *Shokubai*, Vol. **2**, 1 (1947).
- 20) J. Horiuti and T. Yano, Theory of Absorption Tower, *Shokubai*, Vol. **3**, 86 (1948).
- 21) J. Horiuti and J. Suzuki, Exchange Reaction between Hydrogen and Deuterated Ammonia on Nickel Catalyst, *Shokubai*, Vol. **4**, 1 (1948).
- 22) J. Horiuti and T. Kinoshita, Studies on the Prussic Acid Synthesis, *Shokubai*, Vol. **4**, 53 (1948).
- 23) J. Horiuti and Y. Tonomura, *Statistical Mechanics of Chemical Reactions*, Sankyo Publishing Co., Ltd., Tokyo (1950).
- 24) J. Horiuti, T. Yano and K. Kanai, Studies on the Prussic Acid Synthesis. Kinetics and Equilibrium of the Synthesis Reaction, *Shokubai*, Vol. **7**, 8 (1951).
- 25) T. Yano and J. Horiuti, Studies on the Prussic Acid Synthesis. Medium-size Pilot Plant Test, *Shokubai*, Vol. **7**, 32 (1951).

## J. HORIUTI

- 26) J. Horiuti, Theory of Catalytic Reaction Rates (Lecture), Shokubai, Vol. 7, 107 (1951).
- 27) J. Horiuti, Methodology in Chemistry, Kiso-Kagaku, No. 25, 21 (1951).
- 28) J. Horiuti, Studies on the Prussic Acid Synthesis, Mechanism of the Prussic Acid Synthesis Reaction, Shokubai, Vol. 8, 1 (1952).
- 29) J. Horiuti and K. Tanabe, Studies on the Prussic Acid Synthesis. On the Solubility of Prussic Acid to Water, Shokubai, Vol. 8, 24 (1952).
- 30) J. Horiuti, Hydrogen Electrode Reaction, *Kagaku Jikken-gaku (Chemistry Experiments)*, Vol. 3, Physical Chemistry II, Kawade Book Co., Tokyo (1950).
- 31) J. Horiuti, Theory on the Water-gas Shift Reaction, Shokubai, Vol. 8, 58 (1952).
- 32) J. Horiuti, Probabilities involved in the Adsorption of Molecules on Two Adjacent Sites, Shokubai, Vol. 9, 1 (1953).
- 33) J. Horiuti, Y. Watanabe and K. Tanabe, Studies on Catalyst by means of Radioactive Chlorine. Treatment of Catalyst with Hydrogen Chloride, Shokubai, Vol. 9, 21 (1953).
- 34) J. Horiuti, *Catalysis*, Asakura Publishing Co., Tokyo (1953).
- 35) J. Horiuti, K. Tanabe, Y. Watanabe and K. Tanaka, Studies on Catalyst by means of Radioactive Chlorine. The State of Chlorine adsorbed on Catalyst, Shokubai, 9, 30 (1953).
- 36) J. Horiuti and Y. Watanabe, Selective Oxidation of Hydrogen mixed with Carbon Monoxide, Shokubai, Vol. 9, 36 (1953).
- 37) J. Horiuti, Equilibrium and Kinetics, Kagaku to Kogyo, 6, 472 (1953).
- 38) J. Horiuti and M. Yamaguchi, Studies on the Prussic Acid Synthesis. The Reaction Mechanism, Shokubai, Vol. 10, 60 (1954).
- 39) J. Horiuti, K. Tanabe and K. Tanaka, Studies on Catalyst by means of Radioactive Chlorine, Radio-isotopes, 3, 13 (1954).
- 40) G. Toda and J. Horiuti, Quantitative Analysis of Trace Carbon Monoxide included in Hydrogen. The Effect of Carbon Monoxide on the Accommodation Coefficient of Hydrogen on Cobalt, Shokubai, Vol. 11, 26 (1955).
- 41) J. Horiuti, Reaction Rate and Catalytic Reactions, *Jikken Kagaku Koza (Lectures on Experimental Chemistry)*, Vol. 6, Maruzen Book Co. (1956).
- 42) J. Horiuti, The Relation between Rate Constants and Equilibrium Constant, Kagaku to Kogyo, 9, 355 (1957).
- 43) J. Horiuti, Reaction Kinetics and the Concept of the Elementary Reactions, *Kagaku (Chemistry)*, Supplement No. 2, 1 (1957).
- 44) J. Horiuti, T. Sato, Y. Watanabe and K. Ishizuka, Studies on the

*Scientific Publications*

- Prussic Acid Synthesis-13. Medium-scale Pilot Plant Test of the Prussic Acid Synthesis, Shokubai, Vol. **13**, 1 (1956).
- 45) J. Horiuti, T. Sato and K. Ishizuka, Studies on the Prussic Acid Synthesis-14. Direct Synthesis under High Pressure, Shokubai, Vol. **14**, 7 (1957).
  - 46) J. Horiuti and K. Hirota, Adsorption Isotherm allowed for the Interaction among Hydrogen Adatoms, Shokubai, Vol. **16**, 8 (1959).
  - 47) A. Matsuda, M. Fukuda and J. Horiuti, The Stoichiometric Number, Shokubai, **2**, 111 (1960).
  - 48) J. Horiuti, Ammonia Synthesis and the Stoichiometric Number, Shokubai, **2**, 230 (1960).
  - 49) J. Horiuti, Statistical Mechanical Derivation of the Adsorption Isotherm of Hydrogen in the Framework of Crystal Face Theory, Shokubai, **3**, 80 (1961).
  - 50) M. Fukuda and J. Horiuti, Change of the Electrolytic Deuterium Separation Factor with Overpotential on Platinum, Shokubai, **3**, 115 (1961).
  - 51) T. Toya and J. Horiuti, Adsorbed State of Hydrogen on Nickel Metal Surface, Shokubai, **4**, 17 (1962).
  - 52) T. Toya and J. Horiuti, Adsorbed State of Hydrogen on Metal Surfaces, Shokubai, **4**, 324 (1962).
  - 53) J. Horiuti, Approaches in Reaction Kinetics, Kagaku Kogyo, **28**, 167 (1964).
  - 54) J. Horiuti, *Trends in the Theory of Heterogeneous Catalysis*, Buneido P. Co., Sapporo, (1978).
  - 55) J. Horiuti, *Chemical Thermodynamics*, Kodansha Publishing Co., Tokyo, in press.