

Table of Contents

Preface	ii
Photograph and List of Participants	iii
A Short Historical Note on the Passivity of Metals by <i>Go Okamoto</i>	
 Part 1 — Nature of the Passive Film on Iron and Iron Base Alloys	
Passivity of Iron, Nickel, and Cobalt — General Theory of Passivity <i>Norio Sato</i>	1
On Passivity of Iron and Its Alloys <i>Robert P. Frankenthal</i>	10
The Adsorbed Structure of Passive Films <i>H. H. Uhlig</i>	19
The Effect of Electron Configuration on Passive Properties of Cr-Fe-Ni Alloys <i>H. H. Uhlig</i>	21
Ionic Space-Charge-Induced Passivity <i>A. T. Fromhold, Jr.</i>	25
Potential-pH Equilibrium Diagrams for the Iron-Water System, at 25 C, and Their Applications to the Study of the Passivity of Iron <i>Marcel Pourbaix</i>	27
Observations on the Nature of Passivity to be Drawn from Environmental Effects <i>R. T. Foley</i>	32
Passivity of Extremely Corrosion Resistant Iron Alloys <i>Koji Hashimoto, Tsuyoshi Masumoto, and Saburo Shimodaira</i>	34
Relationship Between Properties of Passive Films and Stress Corrosion Cracking Susceptibility of Stainless Steels <i>Saburo Shimodaira</i>	38
Resistmetry and Coulometry of Passive Films on Iron and Its Alloys <i>Shiro Haruyama and Tooru Tsuru</i>	41
On the Nature of the Rust Layers Formed on Steels in Atmospheric Corrosion as a Function of: Alloy Composition, Environmental Composition, Temperature, Electrode Potential <i>Marcel Pourbaix and Luiz R. de Miranda</i>	47
Temperature Scanning Measurement of the Passivity of Stainless Steel <i>Tatsuo Ishikawa</i>	49
Effect of Chemical Environment on Composition of Passive Films on Iron <i>Morris Cohen</i>	55
Distribution of Anion and Proton Across the Barrier Layer of a Porous Anodic Oxide Film on Aluminum <i>Masaichi Nagayama and Hideaki Takahashi</i>	56
Conclusions on the Critical Potential of Passivation to be Drawn from Ellipsometric Studies of Anodic Films on Iron <i>Z. Szklarska-Smialowska</i>	60
<i>In Situ</i> Mössbauer Studies of the Passive Film on Cobalt <i>Gary W. Simmons, Elsie Kellerman, and Henry Leidheiser, Jr.</i>	65
Electron-Microscopical Studies of Passive Films on Stainless Steels <i>J. Yahalom and L. K. Ives</i>	69
The Composition of Passive Films on Ferritic Stainless Steels <i>A. E. Yaniv, J. B. Lumsden, and R. W. Staehle</i>	72
The Effect of Surface Treatment on the Composition of Films on Austenitic Stainless Steels <i>J. B. Lumsden and R. W. Staehle</i>	75
Analysis of the Air-Formed Oxide Film on a Series of Iron-Chromium Alloys by Ion-Scattering Spectrometry <i>R. P. Frankenthal and D. L. Malm</i>	77
On Changes in Surface Composition During Ion Sputtering <i>H. W. Pickering</i>	79
Auger Electron Spectroscopic Analysis of the Passive Film of Stainless Steels <i>Hideya Okada, Hiroyuki Ogawa, Isao Itoh, and Horiyasu Omata</i>	82
Discussion — Part 1	85

Part 2 – Chemical Breakdown of Passive Films

Chemical Breakdown of Passivity <i>Jerome Kruger</i>	91
Pitting Corrosion of Stainless Steels in Chloride Solutions <i>Yoshihiro Hisamatsu</i>	
The Analysis of Passive Current Noise of Stainless Steel Under Potentiostatic Conditions With and Without Chloride Ions <i>Go Okamoto, Koji Tachibana, Sadao Nishiyama, and Tohru Sugita</i>	106
Competitive Adsorption as a Mechanism for Breakdown of Passivity <i>H. H. Uhlig</i>	10
Charged Impurity Drift and Dispersion in Passive Films <i>A. T. Fromhold, Jr.</i>	
How is the Breakdown of Passivity Affected by Thickness and Structure of Oxide Films on Iron and Nickel? <i>Z. Szklarska-Smialowska</i>	
Mechanism of Passivity Breakdown of Pure Iron as Compared to Other Metals <i>J. R. Galvele</i>	18
On the Initiation of and Propagation of Pits <i>J. Yahalom</i>	121
On Oxide Film Stability from the Point of View of Mass and Charge Transfer in the Aqueous Phase <i>H. W. Pickering</i>	124
Composition of Anolyte Within Local Anode of Stainless Steel <i>Tsuguo Suzuki</i>	126
Chloride Ion Adsorption and Pit Initiation on Stainless Steels in Neutral Media <i>B. E. Wilde</i>	129
Ellipsometric Spectroscopic Study of Breakdown of Fe-Cr and Fe-Cr-Mo Alloys <i>C. L. McBee and J. Kruger</i>	131
Iron-Anion Complexes Produced Through Specific Anion Effects <i>R. T. Foley</i>	133
Effect of Alloying Elements, Especially Nitrogen, on the Initiation of Pitting in Stainless Steel <i>K. Osozawa and N. Okato</i>	135
Pitting of Stainless Steels in Organic Acid-Methanol Electrolyte <i>S. Tajima, S. Komatsu, and T. Momose</i>	140
Discussion – Part 2	142

Part 3 – Mechanical Breakdown of Passive Films

A Key Issue in the Study of Stress Corrosion Cracking of Iron Base Alloys – The Transition of Cracking Modes <i>Hideya Okada, Seizaburo Abe, and Tomomi Murata</i>	147
Mechanical Rupture of Protective Films on Iron Base Alloys in Aqueous Environments <i>R. W. Staehle</i>	155
Stress in Passive Films Due to Electrochemical Potential Gradients <i>A. T. Fromhold, Jr.</i>	161
Plastic Deformation and Reactivity of Passive Metals <i>T. Shibata, T. Takeyama, and G. Okamoto</i>	165
Analysis of Crack Propagation Rate in Stress Corrosion Cracking by a Mechanochemical Model Based on Film Rupture <i>N. Ohtani and Y. Hayashi</i>	169
Adsorption and Passivity in the Stress Corrosion Cracking of Steels in Liquid Ammonia <i>B. E. Wilde</i>	
Straining Metal Electrode as a Technique for Evaluation of Stress Corrosion Cracking Susceptibility (AISI 304 1N NaCl + H ₂ SO ₄ Solutions) <i>J. R. Galvele and I. Maier</i>	
Role of Stress in Intergranular Stress Corrosion Cracking of Austenitic Stainless Steel – An Observation Supporting Film Rupture Mechanism <i>I. Matsushima</i>	181
SCC Behavior of Austenitic Stainless Steels in MgCl ₂ Solutions <i>M. Kowaka and T. Kudo</i>	183
Cathodic Reaction at Fresh Surfaces of Stainless Steels Upon Mechanical Breakdown of Passivity – The Effect of Phosphorus Content <i>Tomomi Murata, Eiji Sato, and Hideya Okada</i>	186
Discussion – Part 3	190