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The precursor of the International Society of Electrochemistry[☆]

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Abstract

The International Committee of Electrochemical Thermodynamics and Kinetics (French acronym, C.I.T.C.E.) was the precursor of the International Society of Electrochemistry. This committee was founded in 1949 by Pourbaix with the collaboration of Van Rysselberghe and several European electrochemists. The circumstances and participants at the beginning are evoked as well as some of the activities and the subsequent evolution. © 2000 Elsevier Science Ltd. All rights reserved.

1. Introduction

The precursor of the International Society of Electrochemistry was the International Committee of Electrochemical Thermodynamics and Kinetics or C.I.T.C.E. according to the French acronym. This organization was founded by Marcel Pourbaix with the active and enthusiastic support of Pierre Van Rysselberghe and the encouragement of several leading European electrochemists. My contribution was a minor one.

Professor Niki kindly invited me to write a paper on the 50th anniversary of this event. I asked myself, why would one stir memories of this event from a distant past? Current electrochemistry, after all, is very different from what it was half a century ago. But then, the present-day I.S.E. member might like to know why C.I.T.C.E. was founded and in which conditions. And who were the people involved? I shall try to answer these questions.

2. Three engineers from Brussels

Pourbaix and Van Rysselberghe were engineers and graduates from the Polytechnic School of the University of Brussels. Pourbaix was a faculty member at that

university at the time of the founding of C.I.T.C.E. Van Rysselberghe had pursued an academic career in the United States and was professor of chemistry at the University of Oregon at the time. I graduated as an electrical engineer from the University of Liege as the University in Brussels had been closed during the war. I also had a degree in chemistry. I was appointed to a junior faculty position at the University of Brussels shortly after the end of World War II.

3. Potential–pH diagrams

The thermodynamics of electrode reactions had been a classical topic of research for several decades prior to 1949, and a substantial body of data had been accumulated over the years. These data were examined critically and compiled by Latimer (Berkeley) in a book which soon became the standard reference in the field.

Latimer [1] listed potentials at pH 0 and 14 for many electrochemical reactions. Pourbaix argued convincingly that such lists, limited to the two extreme pH values, often gave an inadequate description of electrochemical systems. Thus, the potential is pH-dependent in many cases, and some reactions occur only at intermediate pH's between 0 and 14. Pourbaix proposed in his thesis [2] to consider all the redox couples involving an element, its ions, its hydroxydes, etc. The corre-

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sponding equilibria are represented in a potential–pH diagram by lines for one or several values of the activities of the soluble species. The resulting diagram clearly shows the domains of thermodynamic stability of the involved species. The construction of such diagrams and some applications are discussed in [3].

The Pourbaix potential–pH diagrams were well received. Evans at Cambridge University, who had done so much to interpret metallic corrosion in aqueous solution on a sound electrochemical basis [4], wrote a preface to the English translation [2] of the Pourbaix thesis. Charlot (Paris) used extensively potential–pH diagrams in the teaching of analytical chemistry [5]. Others who gave their early approval and support included Burgers (Netherlands), Feitknecht (Switzerland), Hoar (Great Britain), Lange (Germany), Piontelli (Italy), Rius (Spain), and Valensi (France). These and other engineers and chemists showed interest in the project, elaborated by Pourbaix, for the creation of an association concerned with the thermodynamics and kinetics of electrode reactions.

4. The early years of C.I.T.C.E.

Pourbaix came to the United States in the Spring of 1949 to discuss his work on potential–pH diagrams in several academic, industrial and government laboratories. He spent a few weeks in Van Rysselberghe's laboratory at the University of Oregon in Eugene, Oregon. I was doing postdoctoral work in this laboratory at that time thanks to a contract Van Rysselberghe had with the Office of Naval Research. Significant government support of unclassified research in American universities was initiated after the end of World War II, and the Office of Naval Research played a leading role in the implementation of this new policy.

I participated in some of the discussions about the future C.I.T.C.E. with Pourbaix and Van Rysselberghe. We also prepared preliminary versions of various potential–pH diagrams which were published at a later date [6,7].

C.I.T.C.E. was founded shortly afterwards. Pourbaix was fully aware that kinetics had to be considered in the interpretation of electrode reactions, but he generally left this aspect to others. His primary goal was the preparation of an atlas of potential–pH diagrams of the elements. Van Rysselberghe had an abiding interest in thermodynamics and its formulation in the case of irreversible processes. He had collaborated with De Donder in Brussels on this problem, and he extended the approach to electrode processes in a later monograph [8].

Annual meetings of the C.I.T.C.E. members started in 1949. These meetings were held in various European cities and were attended mostly by European electrochemists. The membership steadily grew inside and

outside that group as C.I.T.C.E. became better known. The proceedings of these meetings appeared in book form until the 9th meeting in 1958.

Early annual meetings were devoted to a significant extent to the presentation and discussion of papers on potential–pH diagrams and related subjects. Codification of the electrochemical nomenclature was also considered [9], and liaison with I.U.P.A.C. in this area was maintained by Van Rysselberghe.

There was a gradual evolution of the topics covered at annual meetings as major developments were taking place in the 1950s in the theory of electron transfer in solution, electrode kinetics, double layer structure and other areas of electrochemistry. A new generation of electrochemists was coming to the forefront. The long and important chapter on the thermodynamics of electrochemical reactions drew to a close as the atlas of potential–pH diagrams of the elements was published [10] in 1961.

This paper is dedicated to the memory of my friend Pierre Van Rysselberghe.

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