Proceedings: Fourth International Conference on Cold Fusion
Volume 2: Calorimetry and Materials Papers

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FOREWORD

These four volumes include the full text or, in five cases, just the visual materials of papers presented at the Fourth International Conference on Cold Fusion. This meeting was the latest in a series of conferences devoted to a new area of scientific endeavor, variously called, "Deuterated Metals Research", "Anomalous Nuclear Phenomena in Solids", and "Research on New Hydrogen Energy". The first three conferences were held in Salt Lake City, Utah, (U.S.A.), Como, (Italy), and Nagoya, (Japan), in March, 1990, June, 1991, and October 1992, respectively. The authors and participants in this fourth conference should be thanked for four days of stimulating presentations and discussions. A conscious effort was made to maintain a high standard of scientific content and avoid exaggerated claims propagated by various public media. It is gratifying that this effort was largely successful without the need for extraordinary measures.

A number of new experimental approaches were evident compared with the Nagoya meeting. Use of ceramic proton conductors at high temperature was one such. Another was the use of ultrasonic cavitation in heavy water to load palladium and titanium foils with deuterium. Many theoretical papers were given, with some progress evident toward explaining some of these puzzling experimental observations. However, the wide range of theoretical models and speculations shows that the field remains in an exploratory phase, at least for the majority of theorists.

The use of concurrent sessions for the first time caused some attendees to miss hearing significant papers. It is hoped that this compendium of papers will serve to redress that shortcoming. Proceedings, including only those papers passing a rigorous peer review, will appear later as a publication of the American Nuclear Society's Fusion Technology Journal, thanks to the initiative of Editor George Miley.

242 persons from 12 countries registered and attended the conference. The hotel facility and the weather were such as to allow concentration on the technical meetings without serious distraction. Attendees included 124 from the United States, 62 from Japan, 19 from Italy, 11 from Russia, 10 from France, 5 from Canada, 4 from China, 2 from Switzerland, 2 from Germany, and 1 each from Spain, India, and England. A large number of interested persons from the former Soviet Union and eastern Europe were unable to attend but sent several papers that are included in these volumes.
Some 156 abstracts were originally submitted of which 125 papers appear in these proceedings. Since some of the enclosed material is in an unfinished state, the authors would appreciate being contacted by those who desire to reference the work reported here. The papers are divided so that Volume 1 contains all the papers received from authors who participated in the four plenary sessions, Volume 2 includes contributed papers on calorimetry and materials, Volume 3 has contributions on nuclear particle detection and measurement, and Volume 4 contains the papers contributed on theory and special topics. The papers are ordered in the same order of abstracts in the two volumes distributed at the meeting, with a few minor exceptions.

Thanks are due to the International Advisory and the Organizing Committees for their supportive efforts in arranging a successful meeting on such a controversial, yet potentially significant and hence absorbing, topic. Persons particularly active in arranging the agenda were M.C.H. McKubre, S. Crouch-Baker, D. Rolison, T. Claytor, H. Ikegami, and P. Hagelstein. I also wish to thank the following persons who ably served as session chairmen or co-chairmen during the meeting: M. Srinivasan, S. Smedley, P. Hagelstein, F. Tanzella, A. Miller, D. Rolison, S. Crouch-Baker, M. McKubre, K. Kunimatsu, E. Storms, F. Will, T. Claytor, F. Scaramuzzi, H. Ikegami, J. Bockris, G. Miley, B. Liaw, A. Takahashi, J. Cobble and M. Rabinowitz.

Supporting the logistical and physical arrangements were EPRI and the Office of Naval Research (ONR), represented by L. Nelson and R. Nowak respectively. Cosponsoring the meeting in addition to EPRI and ONR, was Comitato Nazionale per la Ricerca e per lo Sviluppo dell'Energia Nucleare e delle Energie Alternative (ENEA), represented by Franco Scaramuzzi. My sincere gratitude goes out to these persons and organizations. Many other organizations implicitly supported the meeting by funding the travel of a number of attendees. Notable among these were ENECO with 21, NEDO with 26, and IMRA with 10 attendees respectively.

The search for a definitive signature of some nuclear reaction correlated with the production of excess heat in the palladium-deuterium system was advanced by the presentations of D. Gozzi, G. Gigli, and M. Miles and their respective coworkers who reported measuring He$^4$ in the vapor phase of both closed and open electrochemical cells. However, the concentrations observed were at levels well below the atmospheric concentration of He$^4$ (5.2 ppmv) and hence are not robustly above criticism as possible atmospheric air contamination. On the other hand, the tritium results of F. Will and coworkers appear robust, with great care taken to establish reliable backgrounds and checking for contamination. I also found the tritium results of T. Claytor and coworkers convincing.
M. Fleischmann, S. Pons, and coworkers provided two papers elaborating the excess heat phenomena: one of the more intriguing results was the excess heat observed well after complete cessation of current flow due to evaporative loss of electrolyte in "boil-off" experiments of the kind first described at the Nagoya meeting.

Several papers using gas loading of palladium claimed evidence of nuclear reaction products. Y. Iwamura and coworkers appear to have replicated the experiment reported by E. Yamaguchi and his NTT coworkers at Nagoya, but emphasizing neutrons and a mass 5 peak in the mass spectrum tentatively assigned to the TD molecule.

The paper chosen by M. Fleischmann in the final panel session as the most outstanding of the conference was by D. Cravens, who on a very modest budget, had discovered many of the better methods for loading palladium with deuterium to high levels and getting the excess heat phenomenon.

Insight into the loading of hydrogen and deuterium into metals was provided by four excellent papers by R. Huggins, R. Oriani, K. Kunimatsu and coworkers, and F. Cellani and coworkers, respectively.

Particularly insightful papers on the theoretical side were presented by R. Bush, S. Chubb, P. Hagelstein, G. Hale, S. Ichimaru, Y. Kim, X. Li, G. Preparata, M. Rabinowitz, A. Takahashi, and J. Vigier.

A thoughtful paper by J. Schwinger was read by E. Mallove at a special evening session. Also, E. Storms gave an excellent summation of the meeting in the final panel session.

I apologize in advance for failing to mention here results from many other equally excellent and significant papers given at the conference.

I agree with and echo H. Ikegami's remarks in the preface of the Nagoya meeting proceedings, "It is my belief that cold fusion will become one of the most important subjects in science, one for which we have been working so patiently, with dedication and with courage, for future generations, for those who will live in the twenty-first century. In order to achieve our goal, our ultimate goal, we must continue and extend our interdisciplinary and international collaboration".

The International Advisory and Organizing Committees met late in the sessions to set the location of the next two meetings. For the next meeting (April 9-13, 1995) Monaco (near Nice, France) was chosen, and in 1996, Beijing, China.
Besides Linda Nelson of EPRI who ably handled the logistics before and at the Conference, S. Creamer of SRI International and E. Lanum of EPRI deserve our thanks for dealing with on-site issues that arise at every large gathering such as this.

I acknowledge with thanks the support of my colleagues at EPRI in planning and organizing this meeting, namely N. Ferris, L. Fielder, K. Werfelman, S. Ennis, B. Klein, R. Claeys, T. Schneider, F. Will, J. Byron, A. Rubio, R. Shaw, R. Jones, J. Taylor, K. Yeager, and R. Balzhiser.

Thomas O. Passell, Editor
Electric Power Research Institute
June 1994
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