

SOCIETÀ ITALIANA DI FISICA

ATTI
DI
CONFERENZE

VOLUME 33

La Scienza della Fusione Fredda

Atti della seconda conferenza annuale sulla fusione fredda

a cura di T. Bressani, E. Del Giudice e G. Preparata
Como, 29 Giugno - 4 Luglio 1991

Centro di Cultura Scientifica «A. Volta», Villa Olmo



Società Italiana di Fisica
Bologna - Italia

Digital Scan by New Energy Times

ITALIAN PHYSICAL SOCIETY

CONFERENCE PROCEEDINGS

VOLUME 33

The Science of Cold Fusion

Proceedings of the II Annual Conference on Cold Fusion

edited by T. Bressani, E. Del Giudice and G. Preparata
Como, 29 June - 4 July 1991

«A. Volta» Centre for Scientific Culture, Villa Olmo



Italian Physical Society
Bologna - Italy

Digital Scan by New Energy Times

Copyright © 1991, by Società Italiana di Fisica

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright owner.

Technical Editing by Carmen Vasini

ISBN 88-7794-045-X

Proprietà Letteraria Riservata
Printed in Italy

Digital Scan by New Energy Times

INTERNATIONAL ADVISORY COMMITTEE

J.O'M Bockris (U.S.A.)
T. Bressani (Italy) (co-chairman)
M. Fleischmann (U.K.)
H. Ikegami (Japan)
X.Z. Li (China)
M. McKubre (U.S.A.)
H. Menlove (U.S.A.)
S. Pons (U.S.A.)
G. Preparata (Italy) (co-chairman)
C. Sanchez Lopez (Spain)
J. Santucci (U.S.A.)
F. Scaramuzzi (Italy)
M. Srinivasan (India)
A. Takahashi (Japan)
F. Will (U.S.A.)

LOCAL ORGANIZING COMMITTEE

G. Casati (Milano)
E. Del Giudice (Milano)
F. De Marco (Frascati)
D. Gozzi (Roma)
F. Iazzi (Torino)
A. Zecchina (Torino)

SPONSORING AGENCIES

- Ansaldo Componenti S.p.a. - Genova (Italy)
- Centro Italiano Studi ed Esperienze - Milano (Italy)
- Consiglio Nazionale delle Ricerche - Italy
- Electric Power Research Institut - Palo Alto (U.S.A.)
- Ente Nazionale Energie Alternative - Italy
- Istituto Nazionale di Fisica Nucleare - Italy
- Regione Lombardia - Italy
- Technova Inc. - Tokio (Japan)
- Universita' degli Studi di Milano - Italy
- Universita' degli Studi di Torino - Italy

CONTENTS

	page
T. BRESSANI, E. DEL GIUDICE and G. PREPARATA - Foreword.....	XIII
 CONTRIBUTED PAPERS =====	
L. BERTALOT, L. BETTINALI, F. DE MARCO, V. VIOLENTE, P. DE LOGU, T. DIKONIMOS MAKRIS and A. LA BARBERA - Analysis of tritium and heat excess in electrochemical cells with Pd cathodes.....	3
E. BRILLAS, G. SARDIN, J. CASADO, X. DOMÉNECH and J. SÁNCHEZ - Product analysis from D ₂ O electrolysis with palladium and titanium cathodes.....	9
B. ESCARPIZO, F. FERNÁNDEZ, J. SEVILLA, F. CUEVAS and C. SÁNCHEZ - Solid state and electrochemical phenomena related to cold fusion in titanium.....	15
D. GOZZI, P.L. CIGNINI, M. TOMELETTI, S. FRULLANI, F. GARIBALDI, F. GHIO, M. JODICE and G.M. URCIUOLI - Multicell experiments for searching time-related events in cold fusion.....	21
Z. HONGYU, W. CHENLIN, R. YANIN, F. GUOYING, Y. HUA, Z. WEIDONG, W. DACHUN, H. MING, L. SHUZHEN, H. ZHUEN, W. ZHONGDA, Y. RUNHU, L. ZHENGHAO and R. GUOXIAO - Some results on cold fusion research.....	49
B. Y. LIAW, P.-L. TAO and B.E. LIEBERT - Recent progress on cold fusion research using molten salt techniques.....	55
G. MENGOLI, M. FABRIZIO, C. MANDUCHI, G. ZANNONI, L. RICCARDI and A. BUFFA - Tritium and neutron emission in conventional and contact glow discharge electrolyses of D ₂ O at Pd and Ti cathodes.....	65
H. NUMATA, R. TAKAGI, I. OHNO, K. KAWAMURA and S. HARUYAMA - Neutron emission and surface observation during a long-term evolution of deuterium on Pd in 0.1 M LiOD.....	71
Y. FUJII, M. TAKAHASHI, M. NAKADA, T. KUSUNOKI and M. OKAMOTO - Anomalous neutron burst in heavy water electrolysis.....	81

S. SZPAK, P.A. MOSIER-BOSS and J. J. SMITH - Reliable procedure for the initiation of the Fleischmann-Pons effect.....	87
A. TAKAHASHI, T. IIDA, T. TAKEUCHI, A. MEGA, S. YOSHIDA and M. WATANABE - Neutron spectra and controllability by PdD/electrolysis cell with low-high current pulse operation.....	93
D. H. BEDDINGFIELD, F.E. CECIL, C.S. GALOVICH, H. LIU and S. ASHER - Characterization of charged particle bursts from deuterium loaded thin titanium foils.....	99
T. BRESSANI, D. CALVO, A. FELICIELLO, C. LAMBERTI, F. IAZZI, B. MINETTI, R. CHERUBINI, A.M.I. HAQUE and R. A. RICCI - A study of the neutron emission from Ti loaded with D in gas phase by means of a time-of-flight spectrometer.....	105
F. CELANI, A. SPALLONE, L. LIBERATORI, F. CROCE, L. STOCELLI, S. FORTUNATI, M. TULUI and N. SPARVIERI - Search for neutron emission from deuterided high temperature superconductors in a very low background environment.....	113
D. W. MO, Y. S.LIU, L. Y. ZHOU, S. Y. DONG, K. L. WANG, S. C. WANG and X. Z. LI - Search for precursor and charged particles in "cold fusion".....	123
A. DE NINNO, F. SCARAMUZZI, A. FRATTOLILLO, S. MIGLIORI, F. LANZA, S. SCAGLIONE, P. ZEPPE and C. PONTORIERI - The production of neutrons and tritium in the deuterium gas-titanium interaction.....	129
S. Y. DUAN, W. S. GUAN, S.Q. CHENG, J. ZHANG, S. L. HAO, B. GU, J.Q. LI, W.X. LIANG, G. Y. ZHANG, S.X. PEI, J. C. HUANG, K. W. CHEN, R. LIU, X. R. LIU and YING LI - Fusion neutron emission induced by injection of deuterium into titanium target in a mirror plasma....	139
S. JIN, F. ZHANG, D. YAO and B. WU - Anomalous nuclear effects in deuterium palladium systems.....	145
F. LANZA, G. BERTOLINI, V. VOCINO, E. PARNISARI and C. RONSECCO - Tritium production resulting from deuteration of different metals and alloys.....	151
T. TAZIMA, K. ISII and H. IKEGAMI - Time-correlated neutron detection from deuterium loaded palladium.....	157
K. L. WANG, X. Z. LI, S. Y. DONG, S. C. WANG, D. W. MO, C.M. LUO, Q. R. LIN, X. D. WU, W.Z. LI, Y. F. ZHU, P. L. ZHOU and L. CHANG - Search for better material for cold fusion experiment using CR-39 detector.....	163

S. C. WANG, T.S. KANG, K.L. WANG, S. Y. DONG, Y.Y. FENG, D. W. MO and X. Z. LI - Identification of the energetic charged particles in gas-loading experiment of "cold fusion" using CR-39 plastic track detector.....	169
D. SEELIGER, M. BITTNER, A. MEISTER, R. SCHWIERZ and T. STREIL - Evidence of neutron emission from a titanium deuterium system.....	175
M. BITTNER, A. MEISTER, D. SEELIGER, R. SCHWIERZ and P. WÜSTNER - Observation of D-D fusion neutrons during degassing of deuterium loaded palladium.....	181
M. BALDO - Enhancement of fusion rate induced by the collective electron excitations.....	187
G. F.CEROFOLINI, R. DIERCKX, A. FOGLIO PARA and G. OTTA- VIANI - Binuclear atoms as fusion precursors in a hot cloud.....	193
S. R. CHUBB and T. A. CHUBB - An explanation of cold fusion and cold fusion by-products, based on lattice induced nuclear chemistry.....	199
P. L. HAGELSTEIN - Coherent and semi-coherent neutron transfer reactions.....	205
F. J. MAYER and J. R. REITZ - Summary of progress in hydron physics.....	211
J. A. McNEIL - Relativistic hyperfine interaction and the Spence-Vary resonance.....	217
M. SHAHEEN, M. RAGHEB, G.H. MILEY, H. HORA and J. KELLY - Anomalous deuteron to hydrogen ratio in Oklo samples and the possibility of deuteron disintegration..	221
A. SCALIA and P. FIGUERA - The cross section factor for the reactions $^2\text{H}(\text{d},\text{p})$ ^3H + $^2\text{H}(\text{d},\text{n})$ ^3He at very low temperature.....	235
T. F. DROEGE and L. J. DROEGE - An improved zero gradient calorimeter for the investigation of cold fusion phenomena.....	243
M. AGNELLO, F. IAZZI, B. MINETTI, E. BOTTA, T. BRESSANI, O. BRUNASSO, D. CALVO, D. DATTOLE, P. GIANOTTI, C. LAMBERTI and A. ZECCHINA - Improvement of the TOFUS apparatus.....	249
G. RICCO, M.ANGHINOLFI, P.CORVISIERO, P. PRATI, M. TAIUTI, C. BORAGNO, R. EGGENHOFFNER and U. VALBUSÀ - A large solid angle multiparameter neutron detector....	255

K. A. SJÖLAND, P. KRISTIANSSON and K. G. J. WESTERGÅRD - Liquid scintillator detection and multiparameter data acquisition for neutron detection in cold fusion experiments.....	261
L. H. BAGNULO - Crack-fusion: a plausible explanation of "cold fusion".....	267
F. E. CECIL and G. M. HALE - Measurement of D-D and D- ⁶ Li nuclear reactions at very low energies.....	271
E. KUZMANN, M. GAL, G.K. SÓLYMOS and CS. SZELES - Mössbauer spectroscopic characterization of samples for cold fusion experiment.....	277
M. S. MATHUR, H.L. JOHNSTON, A. MIRZAI, J. S. C. McCKEE, G.R. SMITH, J. J. G. DUROCHER, K. FURUTANI, J. K. MAYER, Y. H. YEO, H. HNATIUK, S. KING, A. HEMPEL, K. S. SHARMA and G. WILLIAMS - Recent modifications to the Manitoba deuterium implantation accelerator and a study of the properties of the online neutron monitor detector.....	283
H. S. UHM and W. M. LEE - High deuterium concentration in palladium for application to cold fusion.....	289
 INVITED PAPERS =====	
H. IKEGAMI - Cold fusion researches in Japan.....	297
X. Z. LI - Chinese effort in understanding the "cold fusion" phenomena.....	309
V. A. TSAREV - Cold fusion studies in the USSR.....	319
J. O'M. BOCKRIS, D. HODKO and Z. MINEWSKI - The mechanism of deuterium evolution on palladium: relation to heat bursts provoked by fluxing deuterium across the interface.....	337
S. PONS and M. FLEISCHMANN - The calorimetry of electrode reactions and measurements of excess enthalpy generation in the electrolysis of D ₂ O using Pd-based cathodes.....	349
M. H. MILES, B. F. BUSH, G. S. OSTROM and J. J. LAGOWSKI - Heat and helium production in cold fusion experiments.....	363

F. G. WILL, K. CEDZYNSSKA, M-C YANG, J. R. PETERSON, H. E. BERGESON, S. C. BARROWES, W. J. WEST and D. C. LINTON - Studies of electrolytic and gas phase loading of palladium with deuterium.....	373
H. O. MENLOVE, M. A. PACIOTTI, T. N. CLAYTOR and D. G. TUGGLE - Low-background measurements of neutron emission from Ti metal in pressurized deuterium gas...	385
T. N. CLAYTOR, D.G. TUGGLE and H.O. MENLOVE - Tritium generation and neutron measurements in Pd-Si under high deuterium gas pressure.....	395
L. SCHLAPBACH - Hydrogen and its isotopes in and on metals.....	409
M. C. H. McKUBRE, R. ROCHA-FILHO, S. I. SMEDLEY, F. L. TANZELLA, S. CROUCH-BAKER, T. O. PASSELL and J. SAN-TUCCI - Isothermal flow calorimetric investigations of the D/Pd system.....	419
F. SCARAMUZZI - Survey of gas loading experiments.....	445
G. PREPARATA - Cold fusion: what do the laws of nature allow and forbid?.....	453
 SUMMARIES =====	
H. GERISCHER - Is cold fusion a reality? The impressions of a critical observer.....	465
M. FLEISCHMANN - The present status of research in cold fusion.....	475
 APPENDIX =====	
W. N. HANSEN - Report to the Utah State Fusion/Energy Council on the analysis of selected Pons Fleischmann calorimetric data.....	491

EDITORS' FOREWORD

The idea to keep open a fundamental channel of scientific information for people interested in Cold Fusion, came to us while visiting the now defunct National Cold Fusion Institute (N.C.F.I.), in Salt Lake City (Utah) in the Fall of 1990.

For those, like ourselves, who wished to keep the Cold Fusion file open those were very hard times. We were in the middle of a press (and otherwise) attack on the occasion of a scientific review of the N.C.F.I., that was alleged to have been deviously avoided by the two scientists, Martin Fleischmann and Stanley Pons, that made it all happen.

Naturally things went differently from what announced and reported in the press; the review was basically positive, the scientific interest of Cold Fusion was established, but the world, scientific and otherwise, seemed to take no notice and continued in the deep rooted conviction that Cold Fusion, like many other pretended scientific discoveries, permanently belonged to the Museum of Errors.

In organizing the II Annual Conference on Cold Fusion, after the first held in Salt Lake City at the end of March 1990, our main concern and effort has been to keep this event within the strict confines of a scientific meeting. As the more than 200 participants have had the opportunity to witness, the meeting has proceeded with a rather stern and exhausting program for 5 full days, undisturbed, uninterfered by the press or any other external source of perturbation. The discussion has never touched the political aspects (even though some of them are rather interesting), but it has always been focussed on the really burning issues, both experimental and theoretical. For us it has been a most rewarding experience, and we have evidence that such has been the general feeling. And in view of this we have thought it appropriate to give these Proceedings a

title: "The Science of Cold Fusion", which emphasizes what has been the main characteristic of the Conference.

Getting to the contents of the Proceedings, we have decided that the book should give a faithful image of what went on in the 5 days of the Conference. Thus we submitted the papers received to a refereeing process which was kept at a rather lenient level, mitigated by some "Editorial Notes", where some of the basic objections of the Referees were reported, with the aim to correctly represent the points where the disagreement among the interested scientists is more acute.

Following the structure of the Conference, we have organized the book in three main points: one containing the Contributed papers, the second the Invited papers, while the third comprises two summaries, one by Heinz Gerischer and the other by Martin Fleischmann, that actually was not delivered at the Conference, but we thought it worthwhile to include in these Proceedings. Finally in an Appendix, due to its importance in the light of nasty allegations that were made in the press in the last year, we have included the full Report that Wilford Hansen, one of the speakers that most stirred the Conference audience, recently presented to the Utah State Council on Energy/Fusion.

Finally we should like to thank most warmly the Members of the International Advisory Committee who have given their precious advice on the program of the Conference with solicitude and intelligence.

The Local Organizing Committee also performed in an impeccable way, and we take this occasion to gratefully acknowledge their work. We have highly appreciated the very effective collaboration of the "A. Volta" Centre for Scientific Culture in whose premises the Conference took place. The Secretariat carried out its tasks in a very effective and dedicated manner: for this we thank Miss F. De Zan, Miss F. Gandino, Mrs. C. Nuncibello and Miss P. Pistochni.

The Conference could not have taken place without the generous and enthusiastic support of our sponsors; for this we thank them all most deeply.

Tullio Bressani

Emilio Del Giudice

Giuliano Preparata