

TABLE OF CONTENTS

OVERVIEW OF PROGRAMS AND TECHNOLOGY	1
CURRENT STATUS OF MCFC R&D PROGRAM AT NEDO T. Nakayama, NEDO A. Sugawara, AIST, MITI A. Miki, MCFC Research Association	2
THE MTU FRIEDRICHSHAFEN FUEL CELL PROGRAM M. Bischoff, P. Kraus MTU Friedrichshafen GmbH	14
ADVANCED DIR-MCFC FOR CLEAN AND COMPETITIVE POWER A SMARTER concept for cogeneration applications P.J. Kortbeek, R.G. Ottervanger Dutch Fuel Cell Corporation (BCN)	25
THE EVALUATION FOR ADVANCED IHI MCFC COMPONENTS K. Yuasa, H. Kasai, T. Matsuo, A. Matsunaga, M. Hosaka Ishikawajima-Harima Heavy Industries Co., Ltd. (IHI)	30
WORLD-WIDE CARBONATE FUEL CELL POWERPLANT DEVELOPMENT AND COMMERCIALIZATION M.C. Williams United States (U.S.) Department of Energy (DOE), Federal Energy Technology Center (FETC)	40
THE DIRECT CARBONATE FUEL CELL TECHNOLOGY AND PRODUCTS REVIEW M. Farooque, S. Katikaneni, H.C. Maru Energy Research Corporation (ERC)	47
DEVELOPMENT OF 250 kW STACK FOR 1 MW MCFC POWER PLANT S. Sato Ishikawajima-Harima Heavy Industries Co., Ltd. (IHI)	66
VNIIEF RESEARCH ON MOLTEN CARBOBATE FUEL CELLS G.A. Potyomkin, N.G. Kozhuhar, A.V. Anissin, N.N. Batalov*, S.I. Malevanny, A.Y. Malishev, A.Y. Postnikov Russian Federal Nuclear Center – VNIIEF, *Institute of High-Temperature Electrochemistry	80
ASSESSMENT OF TWO ANALYTICAL FUEL CELL MODELS BY PERFORMANCE TESTING AT A 110CM ² MOLTEN CARBONATE FUEL CELL S.F. Au ^a , W.H.A. Peelen ^a , F.R.A.M. Standaert ^a , K. Hemmes ^a , I. Uchida ^b ^a Delft University of Technology, ^b Tohoku University	90
DEVELOPMENT OF LARGE SCALE INTERNAL REFORMING MCFC STACK A. Sasaki, M. Matsumura, Y. Fujita, S. Matsumoto Mitsubishi Electric Corporation (MELCO)	99
M-C POWER COMMERCIALIZATION STATUS E.H. Camara M-C Power Corporation	111

DEVELOPMENT OF DIR-MCFC STACK TECHNOLOGY FOR COGENERATION APPLICATIONS B.G. Rietveld, G.J. Kraaij, R.C. Makkus Netherlands Energy Research Foundation ECN	114
CORROSION	118
THE EFFECT OF GAS COMPOSITION ON HIGH TEMPERATURE CORROSION OF SEPARATOR MATERIAL IN $\text{Li}_2\text{CO}_3\text{-Na}_2\text{CO}_3$ FOR MCFC M. Yanagida, K. Akakabe, K. Tanimoto, T. Kojima, Y. Kitagawa, H. Matsumoto, Y. Miyazaki, M. Azuma Osaka National Research Institute (ONRI), Osaka Institute of Technology	119
BEHAVIOR OF NICKEL-TITANIUM ALLOYS IN MOLTEN $\text{Li}_2\text{CO}_3\text{-Na}_2\text{CO}_3$ AT 650°C E. Gourba, C. Belhomme, M. Cassir Ecole Nationale Supérieure de Chimie de Paris	124
LOW TEMPERATURE CORROSION OF STAINLESS STEEL IN MOLTEN LITHIUM-SODIUM CARBONATE K. Matsumoto, K. Nakagawa Ishikawajima-Harima Heavy Industries Co., Ltd. (IHI)	133
CONDUCTIVITY CONTROLLING OF OXIDE SCALE ON CORRODED METAL COMPONENTS BY APPLYING HETERO-CONTACT TECHNIQUE T. Nishina, K. Tachibana, T. Endo, K. Matsuki Yamagata University	142
CONTACT CORROSION RESISTANCE BETWEEN THE CATHODE AND CURRENT COLLECTOR PLATE IN THE MCFC B. Bergman, C. Lagergren, G. Lindbergh, S. Schwartz, B. Zhu Kungliga Tekniska Hogskolan KTH	150
INFLUENCE OF THE ALLOYING ELEMENTS Mn AND Co ON THE ELECTRICAL RESISTANCE AND CORROSION BEHAVIOR OF BIPOLAR PLATE MATERIALS IN MCFC A.C. Schoeler, T.D. Kaun, M. Krumpelt Argonne National Laboratory (ANL)	158
ANODE, ELECTROLYTE	169
EXPERIMENTAL INVESTIGATION OF THE POROUS NICKEL ANODE IN MCFC G. Lindbergh, M. Olivry, M. Sparr Kungliga Tekniska Hogskolan KTH	170
PERFORMANCE IMPROVEMENTS OF MOLTEN CARBONATE FUEL CELLS AND STACKS APPLYING Li/Na ELECTROLYTE T. Watanabe, F. Yoshida, H. Morita, M. Yoshikawa, Y. Mugikura Central Research Institute of Electric Power Industry (CRIEPI)	178
ADVANCES IN CARBONATE FUEL CELL MATRIX AND ELECTROLYTE C.Y. Yuh, M. Farooque, H. Maru Energy Research Corporation (ERC)	189

ELECTROCAPILLARY BEHAVIOUR OF THE SOLID GOLD-CARBONATE MELT SYSTEM IN OXIDIZING AND REDUCING ATMOSPHERES V.P. Stepanov, N.N. Batalov, V.S. Belyaev, I.V. Yakshovich, S.I. Malevanyi Institute of High-Temperature Electrochemistry	202
<i>IN SITU</i> RAMAN SPECTROSCOPIC INVESTIGATIONS OF OXIDE CHEMISTRY IN MOLTEN CARBONATES T. Itoh, K. Abe, Y. Hisamitsu, M. Mohamedi, I. Uchida Tohoku University	212
IMPROVED MCFC PERFORMANCE WITH Li/Na/Ba/Ca CARBONATE ELECTROLYTE T.D. Kaun, A. Schoeler, C.-J. Centeno, M. Krumpelt Argonne National Laboratory (ANL)	219
CHANGE OF THE BALANCE OF ALKALINE IONS IN ELECTROLYTE OF MOLTEN CARBONATE FUEL CELLS DURING OPERATION Y. Fujita, T. Nishimura, A. Sasaki Mitsubishi Electric Corporation (MELCO)	228
CATHODE	237
INVESTIGATIONS TO THE RATE DETERMINING STEP OF THE OXYGEN REDUCTION REACTION AT MCFC CATHODES B. Rohland, A. Prohaska, U. Jantsch Center for Solar Energy and Hydrogen Research Baden-Wuerttemberg	238
CONVOLUTION VOLTAMMETRY APPLIED FOR THE DIAGNOSIS OF ADSORPTION PHENOMENA DURING THE OXYGEN REDUCTION IN ALKALI CARBONATE EUTECTIC M. Mohamedi, Y. Hisamitsu, Y. Ono, T. Itoh, I. Uchida Tohoku University	242
LiCoO ₂ -COATED NiO CATHODE FOR MCFC S.W. Nam, S.G. Kim, I.-H. Oh, T.H. Lim, H.Y. Ha, S.-A. Hong, K. Kim [*] , H.C. Lim ^{**} Korea Institute of Science & Technology, [*] Korea University, ^{**} Korea Electric Power Research Institute	253
KINETIC AND MECHANISM OF OXYGEN ELECTROREDUCTION AT OXIDE ELECTRODES IN CARBONATE MELTS M. Konopelko and N. Batalov Russian Academy of Science	263
CATHODE MATERIALS FOR MOLTEN CARBONATE FUEL CELLS L. Giorgi, A. Moreno, A. Pozio, E. Simonetti ENEA	265
SYSTEMS / ECONOMICS	287
THE ROLE OF MOLTEN CARBONATE TECHNOLOGY IN THE ENERGY SUPPLY OF THE 21 st CENTURY K. Hemmes Delft University of Technology	288
ULTRA HIGH EFFICIENCY HYBRID DIRECT FUEL CELL / TURBINE POWER PLANT H. Ghezal-Ayagh, R. Sanderson, A.J. Leo Energy Research Corporation (ERC)	297

FUEL CELLS IN THE CHEMICAL INDUSTRY	306
G.P.J. Dijkema Delft University of Technology	
POSTERS	322
THE CO ₂ DISSOLUTION RATE INTO A 52/48 MOL% LI/NA CARBONATE MELT	323
W.H.A. Peelen ^a , K. Hemmes ^a , G. Lindbergh ^b ^a Delft University of Technology, ^b KTH	
CATHODIC PERFORMANCE OF <i>IN SITU</i> OXIDIZED Ni+Al ALLOYS IN MOLTEN Li + Na CARBONATE EUTECTIC	337
Y. Hisamitsu ¹ , Y. Ono ¹ , M. Mohamedi ¹ , T. Itoh ¹ , T. Kudo ² , P. Tomczyk ¹ , I. Uchida ¹ ¹ Tohoku University, ² Tohoku Electric Power Co., Inc.	
ASPECTS OF USING CHEMICAL FLOWSHEETING SOFTWARE IN MCFC APPLICATIONS	347
T.H.M. Kivisaari ¹ , P.C. van der Laag ² Kungliga Tekniska Hogskolan (KTH), Netherlands Energy Research Foundation (ECN)	
EFFECT OF ADDITIVES ON THE SOLUBILITY OF CATHODE MATERIALS IN MOLTEN CARBONATE	358
N. Motohira, T. Sensou, K. Yamauchi, K. Ogawa, N. Kamiya, K. Ota Yokohama National University	
A COMPARATIVE STUDY ON THE USE OF ETHANOL, METHANOL AND METHANE FOR MCFC	361
S. Freni [*] , S. Cavallaro ^{**} , P. Staiti [*] , G. Calogero [*] , N. Mondello [*] , M. Minutoli [*] [*] Istituto CNR-TAE, ^{**} Universita di Messina	
METHOD FOR IN-SITU DETERMINATION OF FLOW DISTRIBUTION IN FUEL CELL STACKS	368
G.J. Kraaij, B.G. Rietveld Netherlands Energy Research Foundation ECN	