

AUTHORS — SEPTEMBER 1985

BLANKET COMPARISON AND SELECTION STUDY

STRUCTURAL MATERIALS DATA BASE ASSESSMENT FOR THE BLANKET COMPARISON AND SELECTION STUDY

John W. Davis (top), a design specialist in materials, is manager of all materials activities in fusion energy at McDonnell Douglas Astronautics Company. He has worked on the design of UWMAK-II and has participated in most of the tokamak reactor studies (UWMAK-III, EPR, TNS, STARFIRE, DEMO, and INTOR) in materials and design-related studies. His current activities include coordinating the activities on the *Materials Handbook for Fusion Energy Systems* and participating in various design studies. **T. A. Lechtenberg** (photograph and biography were not available at time of publication). **Dale L. Smith** (center) (PhD, Iowa State University, 1966) is the associate director of the Fusion Power Program at Argonne National Laboratory (ANL) assisting in directing and planning all fusion activities at ANL. He also serves as program manager for the ANL Fusion Materials Program. He served as program manager for a multilaboratory Blanket Comparison and Selection Study. He currently serves as deputy manager of ANL's effort on the Tokamak Power Systems Study and as ANL representative for the INTOR study. **F. W. Wiffen** (bottom) (PhD, materials science, Northwestern University, 1967) is on the research staff of the Metals and Ceramics Division, Oak Ridge National Laboratory (ORNL), and of the Fusion Engineering Design Center at ORNL. His areas of interest are radiation effects on materials and the applications of materials data to fusion reactor design. Recent activities include participation in the research programs on fusion reactor materials, assessment of environmental implications of a fusion power economy, and several conceptual reactor design studies.

*John W. Davis
T. A. Lechtenberg
Dale L. Smith
F. W. Wiffen*



STRUCTURAL ANALYSIS UNDER THE BLANKET COMPARISON AND SELECTION STUDY

Saurin Majumdar (PhD, University of Illinois, 1973) has been responsible for conducting stress and lifetime analyses of various fusion reactor blanket design studies conducted at Argonne National Laboratory since 1974.

Saurin Majumdar



LIQUID-METAL CORROSION

Omesh K. Chopra (top right) (MAsc and PhD, material science, University of Waterloo, Canada, 1972) is a metallurgist in the Materials Science and Technology Division at Argonne National Laboratory (ANL). He has worked extensively in the areas of liquid-metal corrosion and the effects of flowing sodium and lithium environments on the mechanical properties of structural alloys. **Dale L. Smith** (top left) (PhD, Iowa State University, 1966) is the associate director of the Fusion Power Program at ANL assisting in directing and planning all fusion activities at ANL. He also serves as program manager for the ANL Fusion Materials Program. He served as program manager for a multilaboratory Blanket Comparison and Selection Study. He currently serves as deputy manager of ANL's effort on the Tokamak Power Systems Study and as ANL representative for the INTOR study. **Peter F. Tortorelli** (center right) (BS, physics, Manhattan College, 1973; PhD, metallurgy, University of Illinois, 1978) is a research metallurgist in the Metals and Ceramics Division of Oak Ridge National Laboratory (ORNL). He has spent considerable time studying liquid-metal corrosion in support of the fusion alloy development program and also has research projects in high-temperature oxidation and aqueous corrosion. **Jackson H. DeVan** (bottom left) (BS, metallurgical engineering, Stanford University, 1952; MS, metallurgical engineering, University of Tennessee, 1960) is a group leader/research metallurgist in the Metals and Ceramics Division of ORNL. He has conducted high-temperature corrosion studies at ORNL since 1954. His areas of specialization include corrosion of alloys by lithium and by molten fluoride salts. **Dai Kai Sze** (bottom right) (BS, Taiwan University; MS and PhD, chemical engineering, Massachusetts Institute of Technology) is a staff member at ANL. His current research activities include blanket concept, blanket tritium systems, and transport phenomena.

*Omesh K. Chopra
Dale L. Smith
Peter F. Tortorelli
Jackson H. DeVan
Dai Kai Sze*



SOLID TRITIUM BREEDER MATERIALS—Li₂O AND LiAlO₂: A DATA BASE REVIEW

Yung Y. Liu (top right) (ScD, nuclear engineering, Massachusetts Institute of Technology, 1978) is a staff member of the Materials Science and Technology Division and Fusion Power Program at Argonne National Laboratory (ANL). His current interests in fusion materials include properties and irradiation behavior of solid breeders, neutron multipliers, and electrical insulators. **Michael C. Billone** (top left) [PhD, mechanical engineering, Northwestern University (NU), 1972] is with the Materials Science and Technology Division at ANL. He has taught mechanical and nuclear engineering at NU for seven years, and he has specialized in the thermochemical performance of nuclear ceramics and metals at ANL. His current activities include modeling of tritium transport in solid breeder blankets of fusion reactors and participation in the DEMO, the Blanket Comparison and Selection Study, FINESSE, and the Tokamak Power Systems Study programs. **A. K. Fischer** (bottom right) (BA, chemistry, New York University, 1953; MA, 1955, and PhD, 1958, inorganic chemistry, Harvard University) is a chemist at ANL. He is currently involved with experimental and calculational investigations of breeder/tritium interactions for fusion reactors. **S. W. Tam** (bottom left) (PhD, materials science, SUNY Stony Brook, 1974) is a staff metallurgist in the Chemical Technology

*Yung Y. Liu
Michael C. Billone
A. K. Fischer
S. W. Tam
Robert G. Clemmer
Glenn W. Hollenberg*



Division of ANL. His experience is in the fundamental and applied aspects of the behavior and properties of materials in nuclear technology. His current interest is in the area of the high-temperature properties of solid breeder materials for fusion applications. **Robert G. Clemmer** (top) (PhD, chemistry, University of Wisconsin, 1977) is a chemist at ANL. His present activities include tritium and blanket technology. He is the lead engineer for the current experimental program to study *in situ* recovery of tritium (TRIO-01) from solid breeder blankets. **Glenn W. Hollenberg** (bottom) (BS, ceramic engineering, University of Missouri-Rolla, 1967; PhD, material science, University of Utah, 1971) is a fellow engineer in the Absorber and Ceramics Development Section at the Hanford Engineering Development Laboratory (HEDL). His special interests include ceramic fabrication, irradiation performance, modeling, and component design of both neutron absorber materials (B_4C) and solid breeder materials (Li_2O , $LiAlO_2$. . .). Prior to joining HEDL, he served in the U.S. Air Force at the Air Force Materials Laboratory.



AN ASSESSMENT OF PROBLEMS ASSOCIATED WITH TRITIUM CONTAINMENT

Dai Kai Sze (top right) [BS, Taiwan University; MS and PhD, chemical engineering, Massachusetts Institute of Technology (MIT)] is a staff member at Argonne National Laboratory. His current research activities include blanket concept, blanket tritium systems, and transport phenomena. **Ahmed M. Hassanein** (top left) (BS, nuclear engineering, Alexandria University, 1974; MS, nuclear engineering, 1978, MS, physics, 1981, and PhD, nuclear engineering, 1982, University of Wisconsin) is interested in research on radiation damage, energy deposition, and thermal response of materials. His recent research interests include tritium behavior in materials and ion transport and related phenomena. **Steven J. Piet** (bottom right) (BS and MS, 1979, and ScD, 1982, nuclear engineering, MIT) is currently a member of the Fusion Safety Program of EG&G Idaho at the Idaho National Engineering Laboratory. His major interests and responsibilities include risk assessments, activation product behavior, and lithium compound reactions. He is participating in the Blanket Comparison and Selection Study (BCSS). **C. P. C. Wong** (bottom left) (BS and MS, nuclear engineering, University of Wisconsin; PhD, nuclear engineering, University of Texas) has been involved in blanket design on several different fusion reactor studies since joining GA Technologies Inc. (GA) in 1977. His research interests include fusion reactor blanket thermal hydraulics and magnetohydrodynamics effects and the assessment of tritium breeding materials. He has coordinated the blanket designs on various fusion and hybrid reactor studies. He led the material and design selection for the Lithium Blanket Module Study. He was the principal investigator, representing GA for the Fusion Breeder Program Reactor Study, and the BCSS. He is currently coordinating the elongated tokamak commercial reactor design. **William D. Bjorndahl** (no photograph available) (MS, 1978, and PhD, 1984, chemical engineering, University of California, Los Angeles) is head of the Metals and Ceramics Section at TRW, Inc., where he has worked since 1981. In the area of fusion technology, he has worked in modeling of corrosion product transport in liquid-metal coolant, corrosion of candidate first-wall materials, and various tritium containment and processing schemes.

*Dai Kai Sze
Ahmed M. Hassanein
Steven J. Piet
C. P. C. Wong
William D. Bjorndahl*



A COMPARATIVE MULTIDIMENSIONAL NUCLEAR ANALYSIS OF CANDIDATE BLANKET DESIGNS FOR TOKAMAK AND TANDEM MIRROR REACTOR CONCEPTS

Jungchung Jung (top) (PhD, nuclear engineering, Kyoto University, Japan, 1974) is with the Fusion Power Program at Argonne National Laboratory. His current activities include nuclear analyses for the on-going Blanket Comparison and Selection Study, fusion materials recycle/waste management study, and lithium blanket neutronics/shielding experiment project. He is also responsible for general neutronics method/code development and nuclear data evaluation. **John V. Foley** (BS, nuclear engineering, University of Cincinnati, 1983) is with the Fusion Technology Program at Princeton University and is a U.S. Department of Energy magnetic fusion energy technology fellow.

*Jungchung Jung
John V. Foley*



ENERGY DEPOSITION AND SHIELDING REQUIREMENTS FOR ALL CONCEPTS OF THE BLANKET COMPARISON AND SELECTION STUDY

Yousry Gohar (top) (BS, 1967; MS, 1970; and PhD, 1974, nuclear engineering, Alexandria University, Egypt) is currently a member of the Fusion Power Program and Applied Physics Division at Argonne National Laboratory (ANL). He has more than 18 years of experience in the field of nuclear engineering and computational methods. He worked on many aspects of light water reactors including core design, thermal hydraulics, operation, and maintenance at the Atomic Energy Establishment of Egypt for six years. Before joining ANL, he spent two years at the University of Wisconsin working on fusion reactor designs. He participated in most of the fusion reactor studies (UWMAK-III, TETR, INTOR, Starfire, DEMO, FED, TFCX, FPD, TPSS). His research interests include fusion reactor technology, blanket, shield, design studies, nuclear data, and computational method development. **Shi-tien Yang** (BS, physics, Tunghai University, Taiwan, 1968; PhD, nuclear engineering, Massachusetts Institute of Technology, 1975) is a nuclear engineer in the Fusion Power Program and Applied Physics Division at ANL. Before joining ANL, he worked for Science Applications, Inc., and Nuclear Services Corporation (now Quadrex). His primary interests include nuclear criticality study, neutronics, and shielding analyses for both fission and fusion reactors.

*Yousry Gohar
Shi-tien Yang*

