

## SPECIAL SECTION AUTHORS — JANUARY 1989

### CARBON MATERIALS FOR FUSION APPLICATION

#### **PREFACE: CARBON MATERIALS FOR FUSION APPLICATION**

*Hans Conrads*



**Hans Conrads** (Dipl. Phys., 1962, and Dr. rer. nat., 1966, physics, Rheinisch-Westfälische Technische Hochschule, Aachen, Federal Republic of Germany) has been the technical director of the Institut für Plasmaphysik, Kernforschungsanlage (KFA) Jülich, since 1986, operating and upgrading the Tokamak Experiment for Technology Oriented Research (TEXTOR). During 1984–1985 he served as head of nuclear engineering for the Tokamak Fusion Test Reactor in Princeton. He was head of the TEXTOR experiment at Jülich from 1974 to 1984 and has worked in vacuum ultraviolet spectroscopy at KFA, in solar physics with the National Aeronautics and Space Administration, Langley, and in plasma neutron sources at KFA.

#### **PERFORMANCE OF CARBON TILES AND *IN SITU* CARBON COATINGS IN JET AND TEXTOR**

*Lambertus de Kock*

**Lambertus de Kock** (Ingenieurs diploma, Technische Hogeschool, The Netherlands, 1962) worked from 1964 to 1979 at the FOM Instituut voor Plasmafysica, Nieuwegein, The Netherlands where he obtained a PhD on the interaction of high-power microwaves with plasma (1973). During 1974 he was a member of the Dutch team working on Alcator A. His later work at FOM was on a medium-size toroidal arc “Ringboog.” He joined the Joint European Torus Team at the end of 1979 and was responsible for a number of early diagnostics (magnetics, microwave interferometer, hard X rays). Since 1983 he has been group leader for the Plasma Boundary Diagnostic, which is aimed at understanding the plasma/wall interaction.



## EROSION AND REDEPOSITION OF GRAPHITE BY HYDROGEN PLASMAS

**Dan M. Goebel** (top right) [BS, 1977; MS, 1978; and PhD, 1981, applied plasma physics, University of California-Los Angeles (UCLA)] is a principal development engineer in the Fusion Engineering and Physics Program at UCLA. His primary areas of research include experimental plasma physics and plasma/surface interaction studies in the PISCES facility at UCLA, and tokamak edge plasma investigations associated with pump limiter experiments in the Tokamak Experimental Technology Oriented Reactor (TEXTOR) in the Federal Republic of Germany (FRG). **Joseph Bohdanský** (photo not available) is a member of the research staff of the Max-Planck-Institute of Plasma Physics at Garching, FRG. **Robert W. Conn** (top left) (PhD, California Institute of Technology, 1968) spent 1 year at the Joint Euratom Nuclear Research Center at Ispra, Italy, and 1 year at the Brookhaven National Laboratory before joining the University of Wisconsin (UW) in 1970. While at UW, he served as a professor of nuclear engineering and as director of the Fusion Engineering Program. He has been a member of the UCLA faculty as professor of engineering and applied science, and since 1982 he has been co-director of UCLA's Center for Plasma Physics and Fusion Engineering. His primary research interests include plasma physics, plasma/surface interactions, fusion reactor design, and reactor plasma analysis. **Yoshi Hirooka** (center right) (BS, 1976; MS, 1978; and PhD, 1981, nuclear engineering, Osaka University, Japan) was a research engineer in the Nuclear Materials Division at the Japan Atomic Energy Research Institute from 1981 to 1984. In 1984, he joined the PISCES plasma/surface interaction project at UCLA. He is currently a senior research scientist and leads the experimental efforts in the PISCES project at UCLA. **Wai Kwong Leung** (center left) (BS, 1978, and PhD, 1984, physics, University of Texas-Austin) worked on impurity transport in the TEXT tokamak. Since joining UCLA in 1984, he has worked on the ALT-I pump limiter experiment at TEXTOR, material erosion, *in situ* erosion diagnostics, and graphite pumping experiments in PISCES. **Richard E. Nygren** (bottom right) (BS, 1966, and PhD, 1973, materials science, Northwestern University) has worked on radiation effects on materials at Westinghouse Hanford and on fusion materials applications at the Fusion Engineering Design Center in Oak Ridge National Laboratory. From 1981 to 1985 he was the manager of the Blanket Technology Program at Argonne National Laboratory and then served as special assistant to the director at the U.S. Department of Energy Office of Fusion Energy. In 1986 he joined UCLA, investigating the high-temperature erosion of graphite by high-density plasmas in the PISCES facility and serving as the assistant director of the Institute of Plasma and Fusion Research. **George R. Tynan** (bottom left) (BS, 1983, and MS, 1987, nuclear engineering, UCLA) is a PhD candidate at UCLA in the field of plasma physics. His current research focuses on poloidally asymmetric particle and heat transport in tokamak edge plasmas. Other areas of interest include edge plasma diagnostics, plasma/surface interactions, and plasma turbulence.

*Dan M. Goebel  
Joseph Bohdanský  
Robert W. Conn  
Yoshi Hirooka  
Wai Kwong Leung  
Richard E. Nygren  
George R. Tynan*



## HYDROCARBON FORMATION ON CARBON SURFACES FACING A HYDROGEN PLASMA

**Egon Vietzke** (right) [PhD, physics, University of Freiburg, Federal Republic of Germany (FRG), 1969] joined the Kernforschungsanlage (KFA) Jülich, FRG, in 1971 as a research scientist and group leader in molecular collision chemistry. His present

*Egon Vietzke  
Volker Philipps*



research concerns the plasma/surface interaction of hydrogen and oxygen with low-Z material in simulation experiments as well as in the TEXTOR tokamak. **Volker Philipps** (MS, physics, University of Marburg, FRG, 1976; PhD, Technical University of Aachen, FRG, 1980) joined the KFA in 1977. He has studied the behavior of helium in metals and is currently working in the field of plasma/surface interaction of hydrogen and oxygen with low-Z materials.



#### HYDROCARBON TRANSPORT IN A PLASMA BOUNDARY LAYER

**William D. Langer** (right) is a principal research physicist at Princeton Plasma Physics Laboratory (PPPL). For several years he has been interested in the problem of impurities in the scrape-off region of tokamak plasmas and atomic and molecular processes under these conditions. In addition to working on fusion plasmas, he heads a project to build an intense source of low-energy neutrals for studies in beam solid erosion and beam-gas scattering below 30 eV. **Alicia Butcher Ehrhardt** (photo not available) (PhD, plasma physics, University of Wisconsin-Madison) is a project engineer at PPPL. Recent work includes tokamak edge modeling of carbon and hydrocarbon transport, and modeling of  $H_{\alpha}$  emission in the Tokamak Fusion Test Reactor, using the DEGAS neutral gas transport code.

*William D. Langer  
Alicia Butcher Ehrhardt*



#### THERMAL SHOCK TESTING OF CANDIDATE COMPACT IGNITION TOKAMAK GRAPHITES

**Charles D. Croessmann** (top right) (BS, nuclear engineering, University of Missouri-Rolla, 1981; MS, 1983, and PhD, 1986, nuclear engineering, University of Wisconsin) is a member of the technical staff at Sandia National Laboratories (SNL). He is currently responsible for experiment coordination in the Plasma Materials Test Facility and the operation of the Electron Beam Test System. His current interests include high heat flux testing of plasma-facing components and material response to intense energy deposition. **Neill B. Gilbertson** (top left) (AASEET, DeVry Institute of Technology-Phoenix, 1980) worked at Lawrence Livermore National Laboratory on neutral beam testing before joining SNL in 1983 to work on the development of facilities for, and testing of, high heat flux components. **Robert D. Watson** (bottom right) (PhD, nuclear engineering, University of Wisconsin, 1981) is a staff member at SNL. His research interests include finite element thermal stress analysis and design of high heat flux components. **John B. Whitley** (bottom left) (BS, nuclear engineering, Kansas State University, 1974; MS, nuclear engineering, University of Wisconsin, 1976) is the supervisor of the Fusion Technology Division at SNL. He has been an active participant in the research, design, and construction of plasma-facing components for the last decade.

*Charles D. Croessmann  
Neill B. Gilbertson  
Robert D. Watson  
John B. Whitley*

