Plasma Material Interaction In Controlled Fusion

World Survey of Activities in Controlled Fusion ResearchWorld Survey of Major Activities in Controlled Fusion ResearchWorld Survey of Major Facilities in Controlled FusionWorld Survey of Major Facilities in Controlled Fusion ResearchPhysics of Plasma-Wall Interactions in Controlled FusionWorld Survey of Activities in Controlled Fusion ResearchControlled Nuclear FusionWorld Survey of Major Facilities in Controlled FusionWorld Survey of Major Facilities in Controlled Fusion ResearchProject Sherwood: The U. S. Program in Controlled FusionPlasma-surface Interactions in Controlled Fusion Devices 14World Survey of Activities in Controlled Fusion ResearchNuclear FusionWorld Survey of Major Facilities in Controlled Fusion ResearchPlasma-Material Interaction in Controlled FusionW7-AS contributions to the 11th Conference on Plasma Surface Interactions in Controlled Fusion Devices, (Mito, Ibaraki, Japan, May 23 - 27, 1994), W7-AS contributions to the 21st EPS Conference on Controlled Fusion and Plasma Physics, (Montpellier, France, June 27 - July 1, 1994), W7-AS contributions to the 15th International Conference on Plasma Physics and Controlled Nuclear Fusion Research, (Sevilla, Spain, September 26 - October 1, 1994)Plasma Physics for Controlled FusionWorld Survey of Major Facilities in Controlled FusionIntroduction to Plasma Physics and Controlled FusionWorld Survey of Activities in Controlled Fusion Research D. E. Post Samuel Glasstone Amasa S. Bishop International Atomic Energy Agency Amasa S. Bishop Joachim Roth Cornelis Bobeldijk International Atomic Energy Agency Dirk Naujoks International Conference on Plasma Surface Interactions in Controlled Fusion Devices Kenro Miyamoto Francis Chen International Atomic Energy Agency
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controlled thermonuclear fusion is one of the possible candidates for long term energy sources which will be indispensable for our highly technological society however the physics and technology of controlled fusion are extremely complex and still require a great deal of research and development before fusion can be a practical energy source for producing energy via controlled fusion a deuterium tritium gas has to be heated to temperatures of a few 100 million c corres ponding to about 10 kev for net energy gain this hot plasma has to be confined at a certain density for a certain time one pro mising scheme to confine such a plasma is the use of i tense mag netic fields however the plasma diffuses out of the confining magnetic surfaces and impinges on the surrounding vessel walls which isolate the plasma from the surrounding air because of this plasma wall interaction particles from the plasma are lost to the walls by implantation and are partially reemitted into the plasma in addition wall atoms are released and can enter the plasma these wall atoms or impurities can deteriorate the plasma performance due to enhanced energy losses through radiation and an increase of the required magnetic pressure or a dilution of the fuel in the plasma finally the impact of the plasma and energy on the wall can modify and deteriorate the thermal and mechanical pro perties of the vessel walls

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this book deals with the specific contact between the fourth state of matter i e plasma and the first state of matter i e a solid wall in controlled fusion experiments a comprehensive analysis of the main processes of plasma surface interaction is given together with an assessment of the most critical questions within the context of general criteria and operation limits it also contains a survey on other important aspects in nuclear fusion

this new edition presents the essential theoretical and analytical methods needed to understand the recent fusion research of tokamak and alternate approaches the author describes magnetohydrodynamic and kinetic theories of cold and hot plasmas in detail the book covers new important topics for fusion studies such as plasma transport by drift turbulence which depend on the magnetic configuration and zonal flows these are universal phenomena of microturbulence they can modify the onset criterion for turbulent transport instabilities driven by energetic particles as well as alpha particle generation and typical plasma models for computer simulation the fusion research of tokamaks with various new versions of h modes are explained the design concept of iter the international tokamak experimental reactor is described for inductively driven operations as well as steady state operations using non inductive drives alternative approaches of reversed field pinch and its relaxation process stellator including quasi symmetric system open end system of tandem mirror and inertial confinement are also explained newly added and updated topics in this second edition include zonal flows various versions of h modes and steady state operations of tokamak the design concept of iter the relaxation process of rfp quasi symmetric stellator and tandem mirror the book addresses graduate students and researchers in the field of controlled fusion

this complete introduction to plasma physics and controlled fusion by one of the pioneering scientists in this expanding field offers both a simple and intuitive discussion of the basic concepts of this subject and an insight into the challenging problems of current research in a wholly lucid manner the work covers single particle motions fluid equations for plasmas wave motions diffusion and resistivity landau damping plasma instabilities and nonlinear problems for students this outstanding text offers a

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