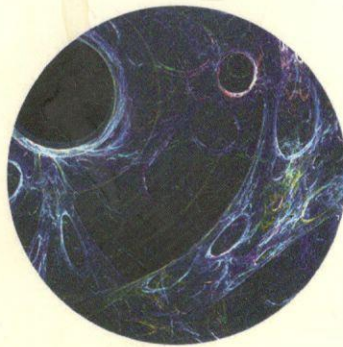
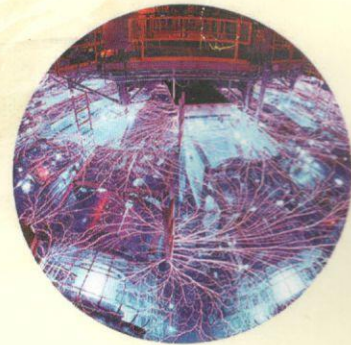
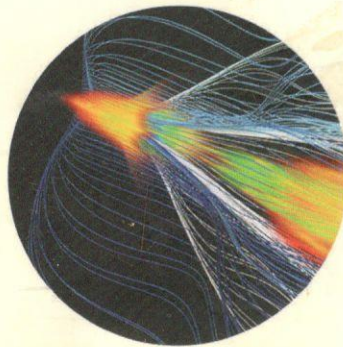
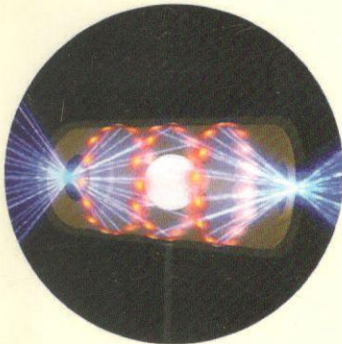
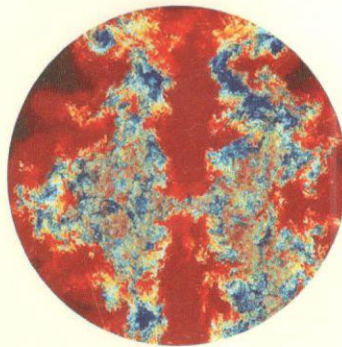
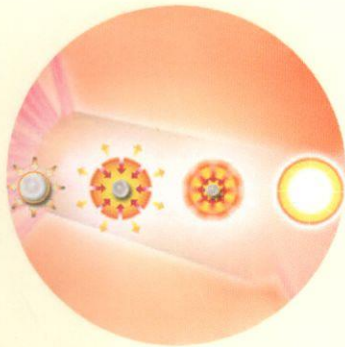





21st International Symposium on
HEAVY ION FUSION
Astana, Kazakhstan • July 18-22, 2016

Book of Abstracts



 NAZARBAYEV
UNIVERSITY
NATIONAL
LABORATORY ASTANA

I S T C

M H T Ц

БИОХИМ
П Р И Б О Р

W. Baigarin

UDC 539.1 (075.8)

LBC 22.333 & 73

J 69

Reviewers:

K.A. Baigarin – Candidate of physico - mathematical Science, Vice President for Innovation and Research, AOE “Nazarbayev University”

A.K. Dauletbekova – Candidate of physico-mathematical Science, Associate Professor, Faculty of Physics and Technical Science, L. N.Gumilyov Eurasian National University

J 69 21st International Symposium on Heavy Ion Inertial Fusion, 2016. Book of Abstracts. – Astana: Nazarbayev University, 2016. – 96 p.

ISBN 978-601-7780-94-4

21st International Symposium on Heavy Ion Inertial Fusion was held in Astana on July 18-22, 2016. The purpose of the symposium was to review the status of heavy ion fusion (HIF) research, and to stimulate further progress in understanding inertial fusion energy production and the science and technology needed for its implementation. Controlled fusion has the potential of becoming an important energy source because the fuel is widely available and because the reaction is relatively clean. Heavy ion accelerators are promising candidate drivers for energy production due to their high repetition rate and high efficiency. A current state of the worldwide HIF facilities and ongoing heavy ion accelerator projects will be also addressed.

UDC 539.1 (075.8)

LBC 22.333 & 73

ISBN 978-601-7780-94-4

Autonomous Organization of Education
“Nazarbayev University”, 2016

Nazarbayev
professor
and Japanese
We welcome

Dieter
Chairman

STUDY OF FLUCTUATIONS IN SECONDARY PARTICLES DISTRIBUTIONS IN INTERACTIONS OF NUCLEI OF DIFFERENT ENERGIES AND ASYMMETRY DEGREE.....	51
I.A. Lebedev, A.I. Fedosimova, E.A.Grushevskaya	
DYNAMICAL SCREENING OF CHARGE POTENTIAL IN CLASSICAL, QUANTUM AND ULTRARELATIVISTIC PLASMAS.....	52
Zh. A. Moldabekov, T.S. Ramazanov, P. Ludwig, J.-P. Joost, M. Bonitz	
EXPERIMENTAL INVESTIGATION OF THE INTERACTION OF PLASMA FLOW WITH THE WALL OF FUSION REACTOR.....	53
A.U. Utegenov, A.B. Tazhen, M.K. Dosbolayev, T.S. Ramazanov	
CREATION OF INTENSE HEAVY ION BEAMS WITH SHORT PULSE DURATION IN BRING AT HIAF.....	54
D. Yin, J. Yang, X.Zhang, L.Mao, G.Shen, H.Du	
POSTER PRESENTATIONS	
IMPACT OF PULSED PLASMA BEAM ON THE THERMAL EROSION AND THE SURFACE STRUCTURE OF GRAPHITE.....	56
T. Aldabergenova, G. Ganeev, S. Kislitsin, Y. Mukhamedova	
EFFECTIVE POTENTIAL OF INTERACTIONS BETWEEN IONS IN DENSE QUANTUM PLASMAS.....	57
S.M. Amirov, T.S. Ramazanov, Zh. A. Moldabekov	
THE STOPPING POWER AND STRAGGLING OF STRONGLY COUPLED ELECTRON FLUIDS REVISITED.....	58
Yu.V. Arkhipov, A.B. Ashikbayeva, A. Askaruly, A.E. Davletov, D.Yu. Dubovtsev, I.M. Tkachenko	
STRUCTURAL DEFECT CREATION BY SWIFT HEAVY IONS IN CAF ₂ SINGLE CRYSTALS.....	59
R. Assylbayev, A. Akilbekov, A. Dauletbekova, A. Lushchik, E. Shablonin, E. Vasilchenko, M. Zdorovets	
GETTING FREE HEAT ENERGY BASED ON CAVITATION AND NUCLEAR FUSION ACCORDING REVINOV'S PILOT PLANTS.....	60
D. A. Aubakir	
ELASTIC AND INELASTIC LONGITUDINAL ELECTRON SCATTERING FROM 9BE IN THE FIRST EXCITED STATE.....	61
O.S.Bayakhmetov, Zh.B.Seksembayev, S.K.Sakhiyev	
INVESTIGATION OF CORRELATION OF GENERATED NUCLEARACTIVE PARTICLES IN THE PROTON-ANTIPROTON ANNIHILATION AT MOMENTA 22.4 AND 32 GEV/C.....	62
E.G.Boos, M.Izbasarov, N.S.Pokrovsky, V.V.Samoilov, T.Temiraliev, R.A.Tursunov, B.O.Zhautykov	
PATENTING THE HIF POWER SYSTEM USING THE SPRFD.....	63
R. J. Burke, A. T. Burke	
JOINT COMPREHENSIVE PLAN OF ACTION OPPORTUNITY FOR HIF IN IRAN.....	64
R. J. Burke, M. S. Monfared, Ch. E. Helsley, A. T. Burke	
STOPPING POWER AND ENERGY LOSS FOR PROTONS IN BE PLASMAS.....	65
B. He, X. Meng, J. Wang	

Experimental investigation of the interaction of plasma flow with the wall of fusion reactor

A.U. Utegenov, A.B. Tazhen, M.K. Dosbolayev*, T.S. Ramazanov

IETP, Al-Farabi Kazakh National University, Almaty, 050040, Kazakhstan

*merlan@physics.kz

One of the problems of controlled fusion physics related to the control of the plasma flow is minimization of erosion of intrachamber components, in particular, the first wall of the reactor, which leads to formation of dust (micron-sized particles) and nanostructured products.

Accumulation of dust in the reactor volume mainly plays a negative role. Firstly, it leads to instability of the high-temperature plasma burning and the emergence of disruptions, secondly, it leads to the capture and accumulation of tritium, which worsens safety of the reactor and its efficiency, etc. [1-5].

Nowadays, carbon or its composites are adopted as materials contacted with plasma used as a facing in the separatrix area of the diverter. Candidate materials are the materials that could characterize the processes occurring with materials from which the reactor is made and to find the best composite, which could replace the material of the reactor.

This work is devoted to the study of the formation of dust at interaction of accelerated pulsed plasma flow with graphite plates. To imitate and investigate this process a plasma accelerator of the coaxial type has been used. The accelerators of such type are universal setup for generation of plasma flow and to investigate its interaction with candidate materials of first wall of the reactors (TOKAMAK). In the experiments, as the plasma-forming gas, hydrogen and argon were used, the charging voltage of the capacitor battery of the accelerator varied from 3 to 14 kV. To determine the energy characteristics of the plasma the Faraday cup and cone calorimeter were used. Pre-treated graphite plates in the interaction with the plasma confirmed formation of a film and particles with highly developed surfaces like "cauliflower" and fractal structures similar to the results of fusion devices (Figure 1). By the results of preliminary investigations it is assumed that the

growth of such structures is probably associated with the processes of deposition and diffusion of adatoms.

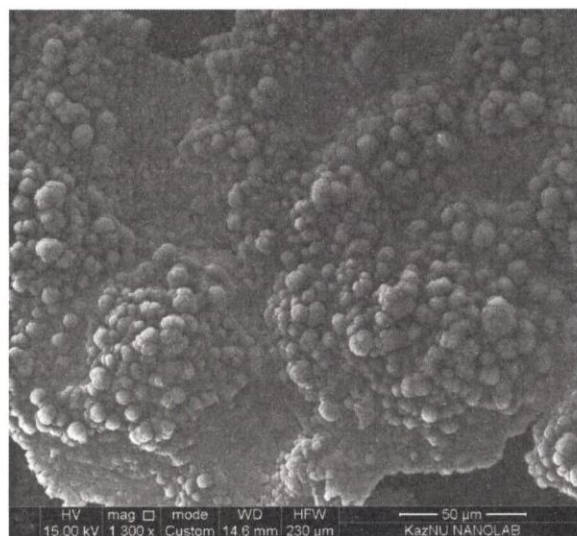


Figure 1. Fractal structure of graphite surface.

References

- [1] J.C. Flanagan, M. Sertoli, M. Bacharis *et al.* 2015 *Characterising dust in JET with new ITER-like wall // Plasma physics and controlled fusion*, **57**, 014037
- [2] V.I. Crauz., Yu.V. Martinenko, N. Yu. Svechnikov, V.P. Smirnov, V.G. Stankevich, L.N. Khimchenko 2010 *Nanostructures in controlled fusion devices // Uspek. Phys. Nauk.*, **180**, 1055-1080
- [3] G. Federici, C.H. Skinner *et al.* 2001 *Plasma-material interactions in current tokamaks and their implications for next step fusion reactors // Nuclear Fusion*, **41**, 1967-1979
- [4] Yu.V. Martinenko, M. Yu. Nagel 2009 *Formation of dust in TOKAMAK (ser. Thermonuclear fusion.)*, 65-72
- [5] H-W. Bartels *et al.* 2000 *Accident Analysis Specifications for GSSR // Safety, Environment and Health Group. Garching ITER Joint Central Team*, 2000