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ROSATOM STATE ATOMIC ENERGY CORPORATION

Joint Stock Company

“State Scientific Center –

Research Institute of Atomic Reactors”

**ХI Conference on Reactor Material Science**

**dedicated to the 55th anniversary of the RIAR’s Materials Testing Complex**

(Dimitrovgrad, 27-31 May 2019)

PROGRAMME

Dimitrovgrad

2019

**Conference Agenda**

**May 27 (Monday)**

Arrival of the participants, accommodation and registration

**May 28 (Tuesday)**

8.00-9.00 Registration

9.00-9.30 Opening of the conference (great hall of the Slavsky Conference Center)

9.30 -12.00 Plenary papers. Session #1 (great hall of the Slavsky Conference Center)

12.00-13.30 Lunch

13.30 -15.30 Plenary papers. Session #2 (great hall of the Slavsky Conference Center)

15.30-15.50 Coffee break

15.50 -17.50 Plenary papers. Session #3 (great hall of the Slavsky Conference Center)

**May 29 (Wednesday)**

8.00-9.40 Section **1** Session # 1 (small hall of the Slavsky Conference Center)

8.00-9.40 Section **2** Session #1 (great hall of the Slavsky Conference Center)

9.40-10.00 Coffee break

10.00-12.00 Section **1** Session #2 (small hall of the Slavsky Conference Center)

10.00-12.00 Section **2** Session # 2 (great hall of the Slavsky Conference Center)

12.00-13.30 Lunch

13.30-15.30 Section **1** Session # 3 (small hall of the Slavsky Conference Center)

13.30-15.30 Section **2** Session #3 (great hall of the Slavsky Conference Center)

15.30-15.50 Coffee break

15.50-17.30 Section **1** Session # 4 (small hall of the Slavsky Conference Center)

15.50-17.30 Section **2** Session# 4 (great hall of the Slavsky Conference Center)

**May 30 (Thursday)**

8.00-9.40 Section **1** Session #5 (small hall of the Slavsky Conference Center)

8.00-9.40 Section **2** Session #5 (great hall of the Slavsky Conference Center)

9.40-10.00 Coffee break

10.00-12.00 Section **1** Session #6 small hall of the Slavsky Conference Center ()

10.00-12.00 Section **2** Session #6 great hall of the Slavsky Conference Center ()

12.00-13.30 Lunch

13.30-15.30 Section **1** Session #7 (small hall of the Slavsky Conference Center)

13.30-15.10 Section **3** Session #1 (great hall of the Slavsky Conference Center)

15.30-15.50 Coffee break

15.30-17.00 Poster section (flow area on the 2nd floor of the Slavsky Conference Center)

17.00-17.30 Close of conference

18.00 Welcome dinner

**May 31 (Friday)**

10.00-13.00 Technical tour

13.00-14.30 Lunch

Departure

TUESDAY, 28 MAY 2019

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| Opening ceremony  **Plenary session #1 (**great hall of the Slavsky Conference Center**)**  **Chairs:** **А. Tuzov**, **А. Izhutov, Е. Zvirр** (JSC “SSC RIAR”) | | 9.00-12.00 |
|  | Opening ceremony  **А. Tuzov**, **А. Izhutov** (JSC “SSC RIAR”) | 9.00-9.30 |
| 1 | Key Results of Post-Irradiation Examinations Performed at JSC “SSC RIAR” in 2014-2018.  **Е.** **Zvir**, V. Zhitelev, А. Zakharov, F. Kryukov, V. Shishin, (JSC “SSC RIAR”) | 9.30-10.00 |
| 2 | Development of New Materials and Challenges of Reactor Materials Science.  **A.V. Dub** (JSC “Science&Innovations”, ROSATOM) | 10.00-10.30 |
| 3 | The Expectations of The Fuel Vendor in The Field of Reactor Material Science of Nuclear Fuel. The Results of The Cooperation and Material Science Aspects of Future Research in The Midterm Perspective  **A. V. Ugryumov** (JSC “TVEL”) | 10.30-11.00 |
| 4 | Corrosion behavior of fuel rod claddings of the VVER  **V. V. Novikov**, V. F. Konkov (JSC “VNIINM”) | 11.00-11.30 |
| 5 | Analysis of The Directions to Create an Accident Tolerant Fuel  **B.A. Kalin, A.V. Tenishev, A.A. Polyansky**  (National Research Nuclear University “MEPhI”) | 11.30-12.00 |
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| **12.00-13.30 Lunch** | | |

#### Plenary Session #2 (Great Hall of the Slavsky Conference Center)

#### 13.30-15.30

**Chair:** А.Ugryumov (JSC “TVEL”), Е. Zvir (JSC “SSC RIAR”)

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| 6 | Development of a new swelling position for PWR austenitic internals, reflecting much lower swelling compared to higher temperature fast reactor experience.  **Frank Garner** (Moscow Engineering Physics Institute, Department of Materials Science, USA) | 13.30-14.00 |
| 7 | The damage and fracture mechanisms of austenitic steels in the irradiated conditions typical for nuclear reactors of various types  **B.Z. Margolin**, A.A. Sorokin, A.A. Bychatsky, V.A. Shvetsova, A.J. Minkin, N.E. Pirogova NRC “Kurchatov Institute” – CRISM “Prometey”) | 14.00-14.30 |
| 8 | Current status and plans for substantiation of mixed nitride fuel for fast neutron reactors  **M.V. Skupov** (JSC “VNIINM”), L.M. Zabudko (ITCP “Proryv”) | 14.30-15.00 |
| 9 | Comparative Analysis of Post-Irradiation Examination Results of Mixed Nitride Fuel Irradiated in BOR-60 and BN-600 Reactors: Influence of Irradiation Parameters on Fuel Life Limiting Factors  A.F. Grachev (1), **L.M.Zabudko** (1), F.N. Kryukov (2), S.I. Porollo (3), M.V. Skupov (4)  (1) ITCP “Proryv”, (2) JSC “SSC RIAR”, (3) JSC “SSC RF-IPPE”, (4) JSC “VNIINM” | 15.00-15.30 |
| **15.30-15.50 Coffee break** | | |

#### Plenary Session # 3 (Great Hall of the Slavsky Conference Center)

#### 15.50-18.20

**Chair:** А. Dub (JSC “Science & Innovations”)

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| 10 | FHASE TRANSFORMATIONS IN IRRADIATED 42CrNiMo ALLOY AFTER ANNELS AT ELEVATED TEMPERATURES, AND ALSO AFTER RAPID ANNEALIND, SIMULATING THE MAXIMUM DESIGN BASIS ACCIDENT  **B.A. Gurovich1**, A.S. Frolov1, D.A. Maltsev1, E.A. Kuleshova1,2, S.V. Fedotova1  1National Research Center “Kurchatov institute”  2 National Research Nuclear University “MEPhI” | 15.50-16.20 |
| 11 | MAIN PROPERTIES OF THE NI-CR ALLOY 42KhNM AND THE PROSPECTS OF ITS IMPLEMENTATION AS A CONSTRUCTION MATERIAL OF VVER ELEMENTS  **G.V. Kulakov**, S.A. Ershov, Yu.V. Konovalov, M.V. Leontyeva-Smirnova, V.N. Rechitsky, M.V. Skupov, V.V. Fedotov  (JSC “VNIINM”, JSC “SSC RIAR”) | 16.20-16.50 |
| 12 | Upgrading of Reactor Cores for Nuclear Icebreakers Based on Operational  Experience and PIE  O.B. Samoylov, **O.A. Morozov**, A.N. Lepekhin, V.Yu. Silayev,  A.A. Zakharychev, V.V. Vasilyev  (JSC “Afrikantov OKBM”) | 16.50-17.20 |
| 13 | Irradiation projects on structural materials in China experimental fast reactor.  **Bin LONG** and Chen HUANG, China Institute of Atomic Energy | 17.20-17.50 |

#### WEDNESDAY, 29 MAY 2019

#### Section 1: Power reactor fuel and fuel elements

#### Session # 1 (Small Hall of the Slavsky Conference Center)

#### Wednesday 8.00-9.40

**Chair:** V.V. Novikov (JSC “VNIINM”)

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| 1 | E110M ALLOY FUEL ROD CLADDINGS IN-REACTOR TESTS IN WATER-COOLED REACTORS AND POST-IRRADIATION EXAMINATION RESULTS  A.Yu. Shevyakov, **V.A. Markelov**, V.V. Novikov, N.S. Saburov, A.Yu. Gusev, V.F. Konkov, M.M. Peregud  (JSC “VNIINM”) | 8.00-8.20 |
| 2 | COMPARATIVE ANALYSIS OF THE STATE OF E110 AND E110 OPT. FUEL ROD CLADDINGS SPENT UP TO 49,6–63,7 MW•DAY/KGU  **A.V. Strozhuk**, V.A. Zhitelev, I.N. Volkova, Yu.D. Goncharenko, A.S. Khrenov,  G.V. Shevlyakov, A.A. Bokov (JSC “SSC RIAR”) | 8.20-8.40 |
| 3 | RESEARCH OF HIGH-TEMPERATURE OXIDATION BEHAVIOR OF E110OPT. AND E110М SPONGE BASED ZIRCONIUM ALLOYS  **A.G. Malgin1**, V.A. Markelov1, V.V. Novikov1, I.A. Shelepov1,  V.E. Donnikov2, V.I. Latunin2   1. JSC “VNIINM”, 2- JSC “VTI” | 8.40-9.00 |

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| 4 | HIGH TEMPERATURE OXIDATION OF THE ALLOY E110  WITH COATINGS BASED ON FeCrNi AND CrNi ALLOYS  **A.S. Yashin1**, B.A.Kalin1, N.V. Volkov1, D.A.Safonov1, P.S. Dzhumayev1,  V.V. Novikov2, V.I. Kuznetsov2, P.V. Fedotov2, A.A. Mokrushin3, K.A. Polunin3  1National Research Nuclear University “MEPhI”  2JSC “VNIINM”  3FSUE “SRI SIA “LUCH” | 9.00-9.20 |
| 5 | CONDITION OF SPACER GRIDS IN THE VVER-1000 FUEL ASSEMBLIES OPERATED FOR THREE TO FIVE FUEL CYCLES  **I.N. Volkova**, V.A. Zhitelev, A.V. Strozhuk and G.V. Shishalova  (JSC “SSC RIAR” ) | 9.20-9.40 |
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| **9.40-10.00 Coffee break** | | |

**Section 1: Power reactor fuel and fuel elements**

**Session # 2 (Small Hall of the Slavsky Conference Center)**

**Wednesday 10.00-12.00**

**Chair:** D.V. Markov (JSC “SSC RF TRINITI”)

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| 1 | Modelling of the elongation of UO2-Gd2O3 fuel rods of VVER-1000  V.V. Novikov, V.I. Kuznetsov, B.I. Nesterov, **P.G. Demyanov**, A.S. Eremenko  JSC “VNIINM” | 10.00-10.20 |
| 2 | In-pile creep of uranium-gadolinium oxide fuel of the type (U0.927,Gd0.073)O2-x at a temperature of 550–900 °С  **A.V. Fedotov1**, E.N. Mikheev1, N.M. Rysev1, V.V. Novikov1, O.A. Bakhteev1, N.A. Degtyarev1,V.B. Malygin2, R.A. Panasenko2, E.G. Belendryasova2,A.L. Izhutov3, A.V. Burukin3, S.V. Seredkin3, G.A. Ilyinykh3, I.N. Volkova3  *1* JSC “VNIINM”, 2National Research Nuclear University “MEPhI”  3JSC “SSC RIAR” | 10.20-10.40  В.Б. Малыгин взять в рамку |
| 3 | INTERIM EXAMINATIONS OF EXPERIMENTAL FUEL RODS TESTED IN THE MIR REACTOR UNDER PWR CONDITIONS  A.L. Izhutov, A.V. Burukin, O.N. Vladimirova, **A.I. Dolgov**, P.A. Ilyin,  V.V. Kalygin, M.A. Mokeichev, V.A. Ovchinnikov (JSC “SSC RIAR”) | 10.40-11.00 |
| 4 | Study of the behavior of VVER-1000 fuel rods in support of power ramp regimes  V. V. Novikov, V. I. Kuznetsov, **B. I. Nesterov** (JSC “VNIINM”)  A.L. Izhutov, A.G. Eshcherkin, V.A. Ovchinnikov (JSC “SSC RIAR”) | 11.00-11.20 |
| 5 | STUDYING OF THE VVER-1000 FUEL RODS BEHAVIOUR UNDER THE LOSS-OF-COOLANT-ACCIDENT (LOCA) CONDITIONS. IN-PILE MIR-LOCA/45 AND MIR-LOCA/69 TESTS  A.V.Alekseev1, **A.V.Goryachev1**, O.I.Dreganov1, A.L.Izhutov1, L.V.Kireeva1, I.V.Kiseleva1, V.N.Shulimov1, V.I.Kuznetsov2, V.V. Novikov2, A.V.Salatov2, P.V.Fedotov2  1 (JSC “SSC RIAR”) 2 (JSC “VNIINM”) | 11.20-11.40 |
| 6 | STUDY OF STAINED SHELLS OF THE FEELS OF REACTOR TYPE PWR WITH PROTECTIVE COATING IN CONDITIONS CHARACTERISTIC FOR AN ACCIDENT WITH HEAT CARRIER LOSS  **A.A. Urusov**, A.A. Mokrushin, D.M. Soldatkin, K.K. Polunin  FSUE “SRI SIA “LUCH” | 11.40-12.00 |
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| **12.00-13.30 Lunch** | | |

**Section 1: Power reactor fuel and fuel elements**

**Session # 3 (Small Hall of the Slavsky Conference Center)**

**Wednesday 13.30-15.30**

**Chair:** G.P. Kobylyansky (JSC “SSC RIAR”)

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| 1 | Main efforts and plans for modernization of the nuclear fuel structure  and materials for WWER RP  **S.A. Kushmanov**  (JSC OKB “GIDROPRESS”) | 13.30-13.50 |
| 2 | ELONGATION OF SKELETON COMPONENTS OF VARIOUS TYPES OF VVER-1000 FAs  G.V. Shevlyakov, V.A. Zhitelev, A.V. Strozhuk, O.G. Sidorenko, A.A. Bokov, A.S. Khrenov  JSC “SSC RIAR” | 13.50-14.10 |
| 3 | DEVELOPMENT AND APPLICATION OF TECHNIQUES FOR EVALUATION OF COOLANT ACTIVITY DURING OPERATION OF WWER POWER UNITS  **P. M. Kalinichev**, I.A. Evdokimov, V.V. Likhanskii, E.Y. Afanasyeva, A.G. Khromov  (JSC “SSC RF TRINITI”) | 14.10-14.30 |
| 4 | INTEGRITY TESTING OF THE TVSA-ALFA FUEL ELEMENTS  BY GAMMA-SPECTROMETRY OF THE GAS PLENUM  **S.S.Sagalov**, V.A.Zhitelev, G.V.Shevlyakov, А.V.Strozhuk, V.G.Teplov, Е.G.Iliyna (JSC “SSC RIAR”) | 14.30-14.50 |
| 5 | EFFECT OF NEUTRON IRRADIATION IN THE VVER-1000 REACTOR ON THE CHARACTERISTICS OF SECONDARY PHASES IN ZIRCONIUM ALLOYS E110 AND E635  **A.V. Obukhov**, G.P. Kobylyansky, S.S. Sagalov, and A.R. Belozerova  (JSC “SSC RIAR”) | 14.50-15.10 |
| 6 | ENGINEERING-ECONOMIC ANALYSIS OF THE USE OF ACCIDENT  TOLERANT FUEL IN NUCLEAR POWER ENGINEERING  **V. V. Kharitonov**, B. A. Kalin, A. N. Silenko, Yu. A. Ul’yanin  National Research Nuclear University “MEPhI” | 15.10-15.30 |
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| **15.30-15.50 Coffee break** | | |

**Section 1: Power reactor fuel and fuel elements**

**Session # 4 (Small Hall of the Slavsky Conference Center)**

**Wednesday 15.50-17.30**

**Chair**: V.А. Markelov (JSC “VNIINM”)

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| 1 | ANALYSIS OF VVER-1000 FUEL RODS ELONGATION UNDER THERMAL TESTS SIMULATING DRY STORAGE CONDITIONS  **G.P. Kobylyansky**, A.O Mazaev, E.A. Zvir, P.A. Ilyin, A.V. Obukhov  (JSC “SSC RIAR”) | 15.50-16.10 |
| 2 | MODELING OF FUEL CLADDINGS MECHANICAL PROPERTIES UNDER DRY STORAGE CONDITIONS  **T.N. Aliev1**, V.V. Likhanskii1, M.Yu. Kolesnik1, O.V. Khoruzhiy1, V.G. Zborovsky1, I.A. Evdokimov1, A.A. Sorokin1, K.E. Ulybyshev1,  1 (SSC “RF TRINITI”)  B.A. Gurovich2, O.O. Zabusov2, D.A. Zhurko2, A.S. Frolov2,  2 (NRC “Kurchatov Institute”)  E.A. Zvir3, P.A. Ilyin3  3(JSC "SSC RIAR") | 16.10-16.30 |
| 3 | PHASE AND STRUCTURAL TRANSFORMATIONS IN THE FUEL CLADDING RODS FROM E110 ALLOY IN THE CONDITIONS OF “DRY” STORAGE  **A.S. Frolov1**, B.A. Gurovich1, E.A. Kuleshova1,2, D.A. Maltsev1, D.V. Safonov1, E.V. Alekseeva1  1 NRC “Kurchatov Institute”  2 National Research Nuclear University “MEPhI” | 16.30-16.50 |
| 4 | DETERMINATION OF DELAYED HYDRIDE CRACKING PARAMETERS TO THE ASSESS THE PROBABILITY OF THEIR DEPRESSURIZATION DURING OPERATION AND DRY STORAGE  **N.S. Saburov**, V.A. Markelov, S.A. Bekrenev, I.A. Shelepov, A.U.Gusev, I.M. Goncharov  JSC “VNIINM” | 16.50-17.10 |
| 5 | MODELLING THE EFFECTS OF NUCLEAR TRANSMUTATION IN THE STUDY OF THE PHYSICAL PROPERTIES OF ZIRCONIUM ALLOYS  **A.R. Belozerova**, S.V. Belozerov, V.K. Shamardin, G.P. Kobylyansky  (JSC “SSC RIAR”) | 17.10-17.30 |

**Section 2:** **Structural materials for nuclear and fusion reactors**

**Session # 1 (Great Hall of the Slavsky Conference Center)**

**Wednesday 8.00-9.40**

**Chair:** B.А. Gurovich (NRC “Kurchatov Institute”)

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| 1 | Structural materials for fast neutron reactors with sodium and lead coolans  **M.V. Leontyeva-Smirnova**, M.V. Skupov, A.A. Nikitina,  I.A. Naumenko, N.M. Mitrofanova (JSC “VNIINM”) | 08.00-08.20 |
| 2 | ROLE of JSC OKB “GIDROPRESS”, JCS “GNC NIIAR” and CNII KM “PROMETEY” in INTERNATIONAL PROJECT ТАСIS 2002 (R2/01.02)  **V.M.Komolov1**, V.V.Evdokimenko1, V.A.Piminov1, I.O.Tregubov1, V.I.Tsofin1, B.Z.Margolin2, A.A.Sorokin2, A.I.Minkin2, I.Yu.Zhemkov3, V.S. Neustroev3, V.K.Shamardin3  1JSC OKB “GIDROPRESS”, 2 NRC “Kurchatov Institute” – CRISM “Prometey”,  3JSC “SSC RIAR” | 8.20-8.40 |
| 3 | INVESTIGATION OF FRACTURE TOUGHNESS OF THE PVI METAL AFTER 45 YEARS OPERATION IN WWER-440 REACTOR OF NOVOVORONEZH NPP  **A.I. Minkin**, B.Z. Margolin, V.N. Fomenko, V.I. Smirnov, A.Ya. Varovin,  N.E. Pirogova, V.A. Shvetsova  (NRC “Kurchatov Institute” – CRISM “Prometey”) | 8.40-9.00 |
| 4 | EFFECT OF LONG-TERM EXPOSURE OF OPERATIONAL PARAMETERS IN VVER-440 REACTOR ON MATERIALS’ STRUCTURE AND PHASE COMPOSITION OF INTERNALS COMPONENTS  **E.A. Kuleshova1,2**, B.A. Gurovich1, A.S. Frolov1, D.A. Maltsev1, S.V. Fedotova1, I.V. Fedotov1, B.Z. Margolin3, A.I. Minkin3, A.A. Sorokin3  1 NRC “Kurchatov Institute”  2 National Research Nuclear University “MEPhI”  3 NRC “Kurchatov Institute” – CRISM “Prometey” | 9.00-9.20 |
| 5 | EXPERIMENTAL INVESTIGATION OF FRACTURE TOUGHNESS  OF AUSTENITIC STEEL OF 18Cr-9Ni GRADE OVER WIDE TEMPERATURE RANGE AFTER LONG TERM NEUTRON IRRADIATION IN BN-600 REACTOR  **A.A. Buchatsky**, B.Z. Margolin, A.G. Gulenko, V.I. Smirnov, N.E. Pirogova, A.A. Sorokin  NRC “Kurchatov Institute” – CRISM “Prometey” | 9.20-9.40 |
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| **9.40-10.00 Coffee break** | | |

**Section 2: Structural materials for nuclear and fusion reactors**

**Session # 2 (Great Hall of the Slavsky Conference Center)**

**Wednesday 10.00-12.00**

**Chair:** B.Z. Margolin (NRC “Kurchatov Institute” – CRISM “Prometey”)

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| 1 | | Swelling, creep and embrittlement of D9 stainless steel cladding and duct in four FFTF driver fuel assemblies after high neutron exposures.  **F. A. Garner**, Moscow Engineering Physics Institute, Department of Materials Science | 10.00-10.20 | |
| 2 | | STUDY OF LOW-TEMPERATURE RADIATION Hardening  OF FERRITIC-MARTENSITIC STEELS  **S.V. Rogozhkin1,2**, A.A. Nikitin1,2, N.A. Iskandarov1, A.A. Khomich1,  V.V. Khoroshilov1, A.A. Bogachev1, A.A. Lukyanchuk1, O.A. Raznitsyn1, A.S. Shutov1, P.A. Fedin1, T.V. Kulevoy1, A.L. Vasilyev3, M.Yu. Presnyakov3, K.S. Kravchuk4, A.S. Useinov4, M.V. Leontyeva-Smirnova5, Е.М. Mozhanov5  1 NRC “Kurchatov Institute” – ITEP  2 National Research Nuclear University “MEPhI”  3 NRC “Kurchatov Institute”  4 FSBI TISNCM  5 JSC “VNIINM” | 10.20-10.40 | |
| 3 | | HIGH TEMPERATURE IRRADIATION EMBRITTLEMENT IN NEUTRON IRRADIATED AUSTENITIS STAINLESS STEELS 08Kh18Ni10T, EI-847, EP-172 AND CHS-68  S.I. Porollo, A.А. Ivanov, Yu.V. Konobeev, S.V. Shulepin  JSC “SSC RF-IPPE” | 10.40-11.00 | |
| 4 | | RADIATION PHENOMENA IN IRRADIATED AUSTENITIC STEELS AFTER LONG IRRADIATION IN BOR-60 REACTOR  **V.S. Neustroev**, S.V. Belozerov, E.I. Makarov, D.E. Markelov, A.V. Obukhov,  D.A. Sokolowsky | 11.00-11.20 | |
| 5 | OPTIMIZATION OF STRUCTURAL-PHASE STATE OF FUEL PIN CLADDINGS MADE OF STEEL EK164 IN ORDER TO INCREASE THE  RESOURCE EFFICIENCY OF FAST NEUTRON REACTORS FUEL  ASSEMBLIES  **T. Churyumova**, N. Mitrofanova (JSC “VNIINM”) | | | 11.20-11.40 |
| 6 | Study on the heat insulation materials with high temperature sodium in sodium-cooled fast reactor.  **Jinquan ZhANG**, Xiaogang FU, Bo QIN, Haoran Ma, Zhangshun RUAN, Liu TAO and Bin LONG (China Institute of atomic energy (CIAE)) | | | 11.40-12.00 |
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| **12.00-13.30 Lunch** | | | | |

**Section 2: Structural materials for nuclear and fusion reactors**

**Session # 3 (Great Hall of the Slavsky Conference Center)**

**Wednesday 13.30-15.30**

**Chair:** M.V. Leontyeva-Smirnova (JSC “VNIINM”)

|  |  |  |
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| 1 | The Effect of Oxygen and Hydrogen on Stress Corrosion Cracking of 304NG Stainless Steel in High Temperature Water with Trace Chloride Ion for PWR Primary Loop.  Peng DeQuan\*, Wang Hui, Hu Yong, Zhang BaoLiang (China Institute of atomic energy, China) | 13.30-13.50 |
| 2 | Microstructural and Chemical Characterization of Irradiation Effects in Claddings with Different Alloy Compositions.  **K. D. Johnsona**, K. I. Lafchieva, D. Jädernäsa, O. Tengstranda, A.Y Shevyakovb, A.B. Dolgovc, A.V. Ugryumovc  aStudsvik Nuclear AB, Sweden  bJSC “VNIINM”, Moscow, Russia  cJSC “TVEL”, Moscow, Russia | 13.50-14.10 |
| 3 | Effect of irradiation on susceptibility of ferritic-martensitic steels to liquid metal embrittlement in liquid lead-bismuth environment.  **S. Gavrilov,** E. Stergar, M. Lambrechts, M. Konstantinovic, J. Van den Bosch  SCK•CEN, Belgian Nuclear Research Centre | 14.10-14.30 |
| 4 | RADIATION CREEP AND SWELLING OF STEEL 08Х18Н10Т AT  350 ÷ 420°С  **E.I. Makarov**, V.S. Neustroev, A.V. Obukhov, D.E. Markelov  (JSC “SSC RIAR”) | 14.30-14.50 |
| 5 | EVOLUTION OF THE MICROSTRUCTURE OF AUSTENITIC STEELS  AFTER IRRADIATION AT 300-350˚С IN REACTORS BOR-60 AND SM-3  D.E. Markelov, V.S. Neustroyev, V.K. Shamardin (JSC “SSC RIAR”)  B.Z. Margolin, A.A. Sorokin (NRC “Kurchatov Institute" - CRISM "Prometey”) | 14.50-15.10 |
| 6 | NEUTRON-DOSIMETRIC SUPPORT OF CONSTRUCTION MATERIALS PROPERTIES RESEARCH EXPERIMENTS IN REACTOR CONDITIONS  **S.A. Enin**, V.V. Pavlov, A.R. Belozerova, T.I. Chernysheva  JSC “SSC RIAR” | 15.10-15.30 |
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|  | **15.30-15.50 Coffee break** |  |

**Section 2: Structural materials for nuclear and fusion reactors**

**Session #4 (great hall of the Slavsky Conference Center)**

**Wednesday 15.50-17.30**

**Chair**: M.V. Skupov (JSC “VNIINM”)

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| 1 | EXAMINATION OF CORROSION IN ЭП823-Ш STEEL CLADDINGS OF THE FUEL RODS WITH LEAD AND HELIUM SUBSTRATES Ilnur F. **Gilmutdinov**\*, F.N. Kryukov\*, O.N. Nikitin\*, I.Yu. Zhemkov\*,  M.V. Skupov\*\*, Yu.A. Ivanov\*\* \* JSC “SSC RIAR” \*\* JSC “VNIINM” | 15.50-16.10 |
| 2 | EXPERIMENT-BASED AND CALCULATION DATA ANALYSIS OF THE OPERATING CONDITIONS FOR THE BOR-60 IRREPLACEABLE COMPONENTS  I.Y. Zhemkov, **Y.V. Naboishchikov**, Y.M. Krasheninnikov  (JSC “SSC RIAR”) | 16.10-16.30 |
| 3 | IRRADIATION-INDUCED SWELLING OF BOR-60 SMALL ROTATION PLUG STUDS V.S. Neustroyev, **D.A. Sokolovsky,** S.V. Belozerov, I.Yu. Zhemkov,  E.I. Makarov, Yu.V. Naboishchikov, A.I. Plotnikov, N.S. Poglyad, N.I. Shirokova  (JSC “SSC RIAR”) | 16.30-16.50 |
| 4 | QUALITY CONTROL PROCEDURE APPLIED TO WELDED JOINTS OF FUEL ELEMENTS FOR BN-800 REACTOR WITH MIXED OXIDE URANIUM-PLUTONIUM FUEL  **M.A. Litvinova,** A.A. Maltsev  FSUE “Mayak Production Association” | 16.50-17.10 |
| 5 | Welding of test specimens and test rigs intended for irradiation testing  **A.V. Kaplin,** E.M. Tabakin, S.A. Andreyev  JSC “SSC RIAR” | 17.10-17.30 |

**THURSDAY, 30 MAY 2019**

**Section 1: Power reactor fuel and fuel elements**

**Session #5 (small hall of the Slavsky Conference Center)**

**Thursday 8.00-9.40**

**Chair:** V.M. Troyanov (JSC “Rosenergoatom Concern”)

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| 1 | MODERNIZATION OF MODELS DESCRIBING BEHAVIOR OF MIXED URANIUM-PLUTONIUM NITRIDE FUEL IN CODE KORAT AND THEIR VERIFICATION ON EXPERIMENTAL DATA  **O.V. Khoruzhii1**, V.G. Zborovskii1, N.N. Elkin1, Ya.R. Lifanov1,  V.V. Likhanskii1, O.N. Nikitin2, A.V.Belyaeva2, Yu.A. Ivanov3, A.Yu. Ivanov3, I.V. Kozhevnikova3, G.A. Kireev3, M.V. Skupov3  1 JSC “SSC RF TRINITI”, 2 JSC “SSC RIAR”,  3 JSC “VNIINM” | 8.00-8.20 |
| 2 | SPECIFIC DETAILS OF SWELLING IN URANIUM-PLUTONIM NITRIDE FUEL USED FOR FABRICATION OF HELIUM GAS- AND LIQUID METAL-BONDED TEST FUEL RODS  **A.V. Belyaeva,** F.N. Kryukov, O.N. Nikitin, S.V. Kuzmin  (JSC “SSC RIAR”) | 8.20-8.40 |
| 3 | THE METHOD OF THE URANIUM SESQUINITRIDE RESIDUAL AMOUNT FOR DETERMINING IN MIXED NITRIDE NUCLEAR FUEL  **M.P. Krivov1**, G.A. Kireev1, A.V. Davydov1, A.V. Tenishev2  1 JSC “VNIINM”, 2 National Research Nuclear University “MEPhI” | 8.40-9.00 |
| 4 | URANIUM-ZIRCONIUM CARBONITRIDE FUEL: PREPARATION FOR STUDIES AT CRITICAL ASSEMBLIES AND IN-PILE TESTS  **A.N. Bakhin1**, Sh.T. Tukhvatulin1, Izhutov A.L. 3, I.E. Galev1,  V. Yu. Vishnevsky1, S.N. Sikorin2, A.V. Kuzmin2, S.G. Mandik2, S.A. Polozov2, T.K. Grigorovich2, Seredkin S.V.3  1 FSUE “SRI SIA “LUCH” 2 Scientific Institution “JIPNR – Sosny” 3 JSC “SSC RIAR” | 9.00-9.20 |
| 5 | Experience and feasibility of co-using oxide and nitride fuels and metal uranium in BN reactors  **Yu.M. Golovchenko1**, M.V. Skupov2  1 JSC “SSC RIAR”  2 JSC “VNIINM” | 9.20-9.40 |
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| **9.40-10.00 Coffee break** | | |

**Section 1: Power reactor fuel and fuel elements**

**Session #6 (small hall of the Slavsky Conference Center)**

**Thursday 10.00-12.00**

**Chair:** G.V. Kulakov (JSC “VNIINM”)

|  |  |  |
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| 1 | Condition and development direction of cores of ice-breaker NPP and SMR  **A.I. Romanov**, V.Yu. Papotin, A.N. Lepekhin, A.A. Zakharychev, S.G. Petrov  JSC “Afrikantov OKBM” | 10.00-10.20 |
| 2 | A Core for small power nuclear power plant  **A.A. Zakharychev,** V.Yu. Papotin, L.M. Stadnik  JSC “Afrikantov OKBM”  A.A. Sheldyakov  JSC “SSC RIAR”  S.I. Korovushkin  PJSC “Mashinostroitelny Zavod” | 10.20-10.40 |
| 3 | EFFECT OF IRRADIATION ON PHYSICAL AND MECHANICAL PROPERTIES AND STRUCTURE OF CHROMIUM-NICKEL ALLOY 42ХНМ  **A.A. Sheldyakov**, V.Yu. Shishin, V.V. Yakovlev  JSC “SSC RIAR”  G.V. Kulakov, Yu.V. Konovalov  JSC “VNIINM” | 10.40-11.00 |
| 4 | Pre-reactor tests of fragments of uranium-zirconium metal fuel rods obtained during the modernization of the reactor core IVG.1M  **K.K. Polunin,** A.N. Bakhin, D.A. Zaytsev, D.M. Soldatkin, V.A. Solntsev  FSUE “SRI SIA “LUCH” | 11.00-11.20 |
| 5 | DEVELOPMENT OF TECHNOLOGY OF MANUFACTURING TVELS WITH SMALL HARMFUL ABSORPTION FOR FAs OF A MODERNIZED ACTIVE ZONE OF THE SM-3 REACTOR  E.L.Sannikov, V.V.Lemekhov, V.G.Kolosovsky, **R.S.Korotkov**, E.L.Lupanina  (PJSC “Mashinostroitelny Zavod”) | 11.20-11.40 |
| 6 | EXAMINATION OF EXPERIMENTAL DISPERSED FUEL COMPOSITIONS TO JUSTIFY THE PERFORMANCE OF LOW NEUTRON POISONING FUEL RODS TO BE USED IN THE SM REACTOR **I.F. Gilmutdinov**, V.Yu. Shishin, F.N. Kryukov, V.V. Pimenov, E.I. Efimov JSC “SSC RIAR” | 11.40-12.00 |
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| **12.00-13.30 Lunch** | | |

**Section 1: Power reactor fuel and fuel elements**

**Session #7 (small hall of the Slavsky Conference Center)**

**Thursday 13.30-15.30**

**Chair:** V.A. Zhitelev (JSC “SSC RIAR”)

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| 1 | Post Irradiation Examinations of Three TVEL Fuel Rods Irradiated in Ringhals NPP during Three Reactor Cycles  **K. I. Lafchieva**, K. D. Johnsona, D. G. Jädernäsa, A.Y Shevyakovb, A.B. Dolgovc, A.V. Ugryumovc  aStudsvik Nuclear AB, Sweden  bJSC “VNIINM”, Moscow, Russia  cJSC “TVEL”, Moscow, Russia | 13.30-13.50 |
| 2 | RESULTS OF POST-IRRADIATION EXAMINATIONS OF THE SPONGE-BASED E100 Opt ALLOY OPERATED AS FUEL CLADDING MATERIAL IN ALTERNATIVE TVSA-ALPHA UP TO ATTAINING A BURNUP OF 42 MW Day/kgU TO ESTABLISH THE EXPERIMENTAL DATABANK IN SUPPORT OF RUSSIAN FUEL LICENSING FOR PWR PLANTS  **Yu.D. Goncharenko1**, S.G. Eremin1, E.V. Chertopyatov1, A.V. Obukhov1,  T.M. Bulanova1, G.M. Shishalova1, A.Yu. Shevyakov2, S.A. Bekrenev2,  V.V. Novikov2, V.A. Markelov2  1 JSC “SSC RIAR”  2 JSC “VNIINM” | 13.50-14.10 |
| 3 | MEASUREMENT OF HYDROGEN CONTENT IN OXIDE FILMS AND METAL OF WATER-COOLED REACTOR FA COMPONENTS MADE OF ZIRCONIUM ALLOYS  **G.V. Shishalova,** G.P. Kobylyansky, A.M. Novikov, I.N. Volkova  (JSC “SSC RIAR”) | 14.10-14.30 |
| 4 | PROBLEMS OF EXAMINING URANIUM AND PLUTONIUM DIOXIDES  USING SCANNING ELECTRONIC MICROSCOPY. POSSIBLE WAYS TO SOLVE THE PROBLEMS. SELECTING OPTIMUM MODE FOR EXAMINATION OF MOX-FUEL FOR BN-800 REACTORS  **A. A. Maltsev,** M. A. Litvinova (FSUE “Mayak Production Association”) | 14.30-14.50 |
| 5 | WATER CHEMISTRY OF MIR REACTOR LOOPS TO TEST NEW FUELS AND MATERIALS  A.L. Izhutov, A.L. Petelin, V.A. Svistunov, **O.N. Vladimirova**, V.I. Vasiliev,  S.A. Dvoinishnikova, E.O. Demidovskaya (JSC “SSC RIAR”) | 15.10-15.30 |
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|  | **15.30-15.50 Coffee break** |  |
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|  | **Poster section** | 15.50–17.00 |

**Section 2: Structural materials for nuclear and fusion reactors**

**Session #5 (great hall of the Slavsky Conference Center)**

**Thursday 8.00-9.40**

**Chair:** E.A. Kuleshova (NRC “Kurchatov Institute”)

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| 1 | METHODOLOGY OF JUSTIFICATION OF RADIATION RESISTANCE OF REACTOR PRESSURE VESSELS OF NUCLEAR PROPULSION SYSTEMS **I.S. Zhaurov1**, V.A.Panov1, V.P.Fedorin1, E.A. Ivanenko2, B.Z. Margolin2,  A.M. Morozov2, V.А. Petrov2, E.V. Yurchenko2 1 JSC “Afrikantov OKBM” 2 NRC “Kurchatov Institute” – CRISM “Prometey” | 8.00-8.20 |
| 2 | VVER vessel steels with guaranteed level of resistance to brittle damage V.V. Orlov, V.N. Skorobogatykh, **N.P. Anosov,** Zh.V. Yurgina, V.A. Mikheev (JSC “RPA “CNIITMASH”)  K.N. Koscheev, S.V. Barsanova (JSC “IRM”)  V.K. Shamardin (JSC “SSC RIAR”) | 8.20-8.40 |
| 3 | DEVELOPMENT FERRITIC STEELS FOR FUEL CLADDING  **B.A. Tarasov1,2,** I.I. Konovalov2, M.D. Savel'yev2, S.N. Nikitin2, M.S. Tarasova2, D.P. Shornikov2  1 JSC “VNIINM”, 2 National Research Nuclear University “MEPhI” | 8.40-9.00 |
| 4 | POST-IRRADIATION EXAMINATIONS OF TUBE BUNDLE FOR STEAM GENERATOR OPG-1 AFTER ITS LONG-TERM OPERATION IN THE BOR-60 REACTOR  **T.M. Bulanova,** V.S. Neustroev, Yu.M. Krasheninnikov, A.A. Karsakov,  Yu.D. Goncharenko, L.A. Evseyev, I.V. Shagvaliev, I.N. Kuchkina,  V.V. Povstyanko, A.G. Prokhorov (JSC “SSC RIAR”) | 9.00-9.20 |
| 5 | CORROSIVE AND MECHANICAL RESISTANCE OF MgO CERAMICS IN MOLTEN SALTS UNDER METALLIZING AND MILD CHLORINATION OF SPENT NUCLEAR FUEL  **Golosov O.A.1**, Khvostov S.S.1, Glushkova N.V.1, Evseev M.V.1, Staritsyn S.V.1, Zaikov Yu.P.2, Kovrov V.A.2, Nikitina E.V.2, Kholkina A.S.2, Kazakovtseva N.A.2  1 JSC “IRM”  2 IHTE UB RAS | 9.20-9.40 |
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| **9.40-10.00 Coffee break** | | |

**Section 2: Structural materials for nuclear and fusion reactors**

**Session #6 (great hall of the Slavsky Conference Center)**

**Thursday 10.00-12.00**

**Chair:** V.S. Neustroev (JSC “SSC RIAR”)

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| 1 | RADIATION TOLERANCE OF ULTRAFINE-GRAINED MATERIALS PRODUCED BY SEVERE PLASTIC DEFORMATION  **N.A. Enikeev1,2,\***, V.K. Shamardin3, B. Radiguet4  1 Ufa State Aviation Technical University 2 Saint Petersburg State University 3 JSC “SSC RIAR” 4 Normandie Univ, UNIROUEN, INSA Rouen, CNRS, Groupe de Physique des Matériaux | 10.00-10.20 |
| 2 | MECHANICAL PROPERTIES AND STRUCTURE OF IRRADIATED ULTRA-FINE GRAINED STEEL 08Х18Н10Т PRODUCED BY EQUAL-CHANNEL ANGULAR PRESSING  V.K. Shamardin1, T.M. Bulanova1, **A.A. Karsakov1**, A.V. Obukhov1, L.A. Evseyev1, E.P. Belan1, R.Z. Valiev2, N.A. Enikeyev2, I.V. Alexandrov2, M.M. Abramova2, A.K.Glushkova3  1. JSC “SSC RIAR” 2. Ufa State Aviation Technical University  3. National Research Nuclear University “MEPhI” | 10.20-10.40 |
| 3-4 | Production of Large Monocrystalline Ingots and Discs of Molybdenum and its Alloys by Means of Electron-Beam Zone Melting for Fabrication of Special-Purpose Products  E.G. Kolesnikov, **V.A. Stepanov,** **P.A. Stepanchikov,** R.A. Fedoseev,  A.N. Shotaev FSUE “SRI SIA “LUCH” | 10.40-11.20 |
| 5 | CLASSIFICATION OF IRRADIATION RIGS FOR MATERIAL TESTING IN BOR-60 REACTOR  1,2V.Yu. Anisimov, 1S.G. Eremin, 1,2A.V. Boev, 1I.Yu. Zhemkov, 1A.I. Plotnikov, 1,2**N.S. Poglyad**  1 JSC “SSC RIAR”  2 National Research Nuclear University “MEPhI” | 11.20-11.40 |
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| **12.00-13.30 Lunch** | | |

**Section 3:** **Absorbing and moderating materials**

**Session #1 (great hall of the Slavsky Conference Center)**

**Thursday 13.30-15.30**

**Chair:** V.D. Risovany (JSC “Science and Innovations”, ROSATOM State Corporation)

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| 1 | Tritium and helium release from beryllium-based materials irradiated up to high neutron doses  **V. Chakin**\*, R. Rolli  Karlsruhe Institute of Technology, Institute for Applied Materials | 13.30-13.50 |
| 2 | EFFECT OF NUCLEAR REACTION PRODUCTS IN BERYLLIUM ON RESEARCH REACTOR PHYSICAL AND PROCESS PARAMETERS  **A.P. Malkov,** V.V. Pimenov, V.V. Kalygin (JSC “SSC RIAR”) | 13.50-14.10 |
| 3 | Investigation compatibility B4C pellet with stainless steel cladding and high temperature sodium for sodium-cooled fast reactor.  **Bo QIN**, Xiaogang FU and Bin LONG  China Institute of Atomic Energy | 14.10-14.30 |
| 4 | POST-IRRADIATION EXAMINATIONS OF ABSORBER MATERIAL FOR COMPOUND ABSORBER RODS OF THE VVER CONTROL AND PROTECTION SYSTEM AFTER OPERATION IN THE VVER-1000 REACTORS OF KALININ AND BALAKOVO NUCLEAR POWER PLANTS  **A.V. Zakharov**, E.M. Muraleva (JSC “SSC RIAR”) | 14.30-14.50 |
| 5 | THERMAL AND PHYSICAL PROPERTIES OF NUCLEAR-REACTOR-GRADE GRAPHITE IRRADIATED UP TO HIGH NEUTRON FLUENCE VALUES  **E.P. Belan**, D.V. Khar’kov (JSC “SSC RIAR”) | 14.50-15.10 |
|  | **15.30-15.50 Coffee break** |  |
|  | **Poster section** | 15.30-17.00 |
|  | **Conference wrap-up** | 17.00-17.30 |
|  | **Speeches of conference guests: A.V. Ugryumov,** **B.A. Kalin, M.V. Skupov,**  **B.Z. Margolin, B.A. Gurovich, Frank Garner** |
|  | **Close of conference: А.A. Tuzov, А.L. Izhutov, Е.A. Zvir** |

**THURSDAY, 30 MAY 2019**

**15.50 – 17.00 Poster section (flow area on the 2nd floor of the Slavsky Conference Center)**

**Chair:** V.S. Neustroev (JSC “SSC RIAR”)

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| 1 | EFFECT OF THE DAMAGE DOSE ACCUMULATION RATE ON THE MICROSTRUCTURE OF Fe-18Cr-10Ni-Ti STEEL IRRADIATED IN THE BOR-60 REACTOR AT 330-350°С  **D.E. Markelov**, A.V. Obukhov, V.S. Neustroev  JSC “SSC RIAR” |
| 2 | MOLECULAR DYNAMIC SIMULATION OF ATOMIC DISPLACEMENT CASCADES IN BINARY ALLOYS ZR-(0.5-3)%NB. ANALYSIS OF THE DISTRIBUTION OF NIOBIUM ATOMS IN SELF-INTERSTITIAL CONFIGURATIONS **P.E. Kapustin,** M.Yu. Tikhonchev, V.V. Svetukhin  Ulyanovsk State University |
| 3 | PREDICTION OF THE SAV-1 ALLOY PROPERTIES UNDER NEUTRON IRRADIATION CONDITIONS TO JUSTIFY RADIATION LIFE TIME OF THE RESEARCH NUCLEAR REACTOR  O.V. Golubeva1, V.A. Petrov1, E.A. Ivanenko1, A.M. Morozov1, **S.R. Fridman2**,  B.S. Rodchenkov3, A.V. Vasiliev4  1 NRC “Kurchatov Institute” – CRISM “Prometey”  2 NRC “Kurchatov Institute” – PNPI  3 JSC “NIKIET”  4 JSC “RIPC named by L.Y. Karpov” |
| 4 | CONTRIBUTION OF SWELLING AND IRRADIATION-INDUCED CREEP INTO THE TOTAL DEFORMATION OF BN-600 FUEL PIN CLADDINGS MADE OF STEEL CHS68-ID BY THE ADVANCED TECHNOLOGY  **P.I. Grin,** V.S. Neustroyev, A.V. Strozhuk (JSC “SSC RIAR”) |
| 5 | TUBULAR SAMPLES SHORT-TERM MECHANICAL TENSILE TESTS METHODS IMPROVING TO CREATE A DATABASE ON POST-IRRADIATION PROPERTIES OF ZIRCONIUM ALLOYS  **A.Yu. Shevyakov1**, A.Yu. Gusev1, S.A. Bekrenev1, V.A. Markelov1, V.V. Novikov1,  Yu.D. Goncharenko2, S.G. Eremin2, E.V. Chertopyatov2  1 JSC “VNIINM”  2 JSC “SSC RIAR” |
| 6 | Post-irradiation examinations of welded joints for steam generator in operation in the BOR-60 reactor **S.A. Andreyev,** Yu.V. Ivanovich, E.M. Tabakin, T.M. Bulanova, O.Yu. Makarov,  Yu.M. Krasheninnikov JSC “SSC RIAR” |
| 7 | Study on the Behavior of Delayed Hydride Cracking and Microstructure of Zr-2.5Nb Pressure Tube Material  **Bian Wei,** Guo Lina  Department of Reactor Energying Research and Design, China Institute of Atomic Energy |
| 8 | The fuel-cladding chemical interaction test between lanthanide containing U-Zr metallic fuel and HT9 **In-Su Han** \*, Ju-Seong Kim, Jin-Sik Cheon  Korea Atomic Energy Research Institute |
| 9 | A MATHEMATICAL MODEL OF RADIATION SHAPE CHANGING OF CORE ASSEMBLIES OF FAST SODIUM-COOLED REACTORS AND ITS IMPLEMENTATION IN A CURRENT ANALYTICAL CODE  O.Yu. Vilensky, **A.V. Ryabtsov**  (JSC “Afrikantov OKBM”) |
| 10 | BEHAVIOR OF VVER-1000 FUEL RODS UNDER SIMULATED DRY STORAGE CONDITIONS  **P.A. Ilyin,** E.A. Zvir, P.I. Grin  JSC “SSC RIAR” |
| 11 | Elaboration of method for testing mechanical properties of tubular specimens under internal pressure of plastic filler S.G. Eremin, **D.V. Khar’kov,** D.A. Glushkov  JSC “SSC RIAR” |
| 12 | ATOMISTIC SIMULATION OF SELF-DIFFUSION ON THE GRAIN BOUNDARIES IN HCP ZIRCONIUM  **M.Yu. Tikhonchev**, V.V. Svetukhin  Ulyanovsk State University |
| 13 | ANALYSIS OF THE VVER-1000 FUEL ROD THERMAL-MECHANICAL STATE BASED ON THE MIR-LOCA/72 EXPERIMENT DATA  Alekseev A.V., **Dreganov O.I.,** Zakharova L.P., Kireev N.V., Kiseleva I.V., Shulimov V.N. (JSC “SSC RIAR”) |
| 14 | PRELIMINARY RESULTS AND PROSPECTS OF NMR SPECTROSCOPY METHODS IN THE STUDY OF THE PHASE COMPOSITION OF URANIUM MONONITRIDE  **V.V. Ogloblichev1**, A.M. Potapov2, S.V. Verkhovskii1  1 IMP UB RAS  2 IHTE UB RAS |

**FRIDAY, 31 MAY 2019**

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| Technical tour | 10.00-13.00 |
| **13.00-14.30 Lunch** | |

Departure of participants