OECD Nuclear Energy Agency
International Workshop on

Structural Materials for Innovative Nuclear Systems (SMINS-7)

31 March – 3 April 2025, Madrid, Spain

Venue:

Centro Superior de Investigaciones Científicas (CSIC) HQ

Aula Magna Calle de Serrano n. 117

28006

Organised by Ciemat

With support from

Monday, 31 March, CSIC Auditorium		
8:30 – 9:00	**Arrival/registration** (Hall)	
Session 0: Introductions, Chair: Marta SERRANO (Ciemat)		
9:00 – 9:10	**Welcome address from CSIC**	Dña. Eloisa DEL PINO (CSIC, President)
9:10 – 9:20	**Welcome address from Ciemat**	Dña. Yolanda BENITO (Ciemat, Director General)
9:20 – 9:40	**Welcome address from OECD-NEA EGSM**	Fanny BALBAUD (CEA, EGSM Chair)
9:40 – 10:00	**Invited 1:** Materials for sustainable and competitive nuclear energy: the CONNECT-NM co-funded European partners	Lorenzo MALERBA (Ciemat)
Session 1: Assuring performance in materials produced by advanced manufacturing Chair: Manuel POUCHON (PSI)		
10:00 – 10:30	**Invited 2:** GIF AMME working group: Advanced manufacturing benchmarks though international collaboration	Isabella VAN ROOYEN (PNNL)
10:30 – 10:50	**Talk 1:** Characterization of 316L produced by AM by small punch tests	Marta SERRANO (Ciemat)
10:50 - 11:20	**Coffee Break**	
11:20 – 11:40	**Invited 3:** Overview of the Advanced Materials and Manufacturing Technologies (AMMT) Program	Isabella VAN ROOYEN (PNNL)
11:40 – 12:00	**Talk 2:** High Temperature Mechanical Properties of LP-DED Additively Manufactured 316L Stainless Steel	Suk Hoon KANG (KAERI)
12:00 – 12:20	**Talk 3:** Impact of Irradiation on Microstructure and Properties of Materials Produced by Advanced Manufacturing	Rongjie SONG (INL)
12:20 – 12:40	**Talk 4:** Comparing the Ion Irradiation Response of Heat-Treated Additively Manufactured and Wrought 316L Alloys	Benjamin Mark JENKINS (UKAEA)
12:40 – 13:00	**Discussion 1: Assuring performance in materials produced by advanced manufacturing**	
13:00 - 14:50	**Lunch Break**	
Session 2a: Experimental studies of materials behaviour in irradiation testing Chair: Lorenzo MALERBA (Ciemat)		
14:50 – 15:20	**Invited 4:** IAEA Round Robin Study of Ion Irradiated Microstructures in Alloy T91	Celine CABET (CEA)
15:20 – 15:50	**Invited 5:** A perspective on the value of ion irradiation for achieving improved understanding of radiation effects in materials	Steven ZINKLE (University of Tennessee)
15:50 – 16:10	**Talk 5:** Development of austenitic oxide-dispersion strengthened (ODS) steels for GEN IV reactors cladding	Paul BARET (CEA)
16:10 – 16:30	**Talk 6:** Irradiation Microstructure Challenge Problem for Accelerated Irradiation Effects Qualification	Stephen TALLER (UT-Battelle/ORNL)
16:30 – 16:50	**Talk 7:** Optimizing thermo-mechanical treatments for reduction of irradiation-induced swelling in a 321 stainless steel	Olivier TISSOT (CEA)
16:50 - 17:20	**Coffee Break**	
Session 2b: Principles of design, manufacturing and performance of medium and high entropy alloys Chair: Daniel SHEPHERD (OECD-NEA)		
17:20 – 17:40	**Talk 8:** Advancing Design of HEAs for Nuclear Applications through Large Language Model-Powered Text Mining and Pattern Analysis	Diego WACKERLING (University of Concepcion)
17:40 – 18:00	**Talk 9:** Development of nanostructured medium entropy alloys and their swelling characteristics under ion irradiation	Hiroshi OKA (Hokkaido University)
18:00 – 18:20	**Talk 10:** Heavy Ion Bombardment Impact on Structure and Properties of Nitride Coating on the Base of High Entropy Alloy (TiZrAlYNb)N	Sergey KISLITSIN (Institute of Nuclear Physics, National Nuclear Centre of Kazakhstan)
18:20 – 19:00	**Discussion 2: Irradiation testing and high entropy alloys**	
19:00	**Adjourn**	

Tuesday, 1 April, CSIC Auditorium		
8:30 – 9:00	**Arrival/registration** (Hall)	
Session 3a: Resistance to molten salt environments **Chair: Alfons WEISENBURGER (KIT)**		
9:00 – 9:30	**Invited 6:** Accelerated Discovery of Corrosion Resistant Materials for Molten Salt Applications	Fanny BALBAUD (CEA)
9:30 – 9:50	**Talk 11:** Corrosion of high-aluminum stainless steels in molten chloride salts – effect of UCl3 and crucible materials	Changheui JANG (KAIST)
9:50 – 10:10	**Talk 12:** Evaluation and Qualification of Ni-based Alloys Fabricated by Additive Manufacturing	Sebastien DRYEPONDT (ORNL)
10:10 – 10:30	**Talk 13:** Development of a nano-reinforced nickel-based alloy for use in Molten Salt Reactors	Olivier TISSOT (CEA)
10:30 – 10:50	**Talk 14:** Enhanced High-Temperature Properties of Oxide Dispersion-Strengthened Ti-6Al-4V Alloy for Nuclear Applications	Woohyeok KIM (Hanbat National University)
10:50 – 11:20	**Coffee Break**	
Session 3b: Resistance to extreme aqueous environments **Chair: Dong-Jin KIM (KAERI)**		
11:20 – 11:50	**Invited 7:** The corrosion behaviour of 310S and 800H in supercritical water studied in the ECC-SMART project	Alberto SAEZ MADERUELO (Ciemat)
11:50 – 12:10	**Talk 15:** Ion beam assessment of oxidation behaviour of 800H and 310S alloys in supercritical water	Zoltan SZARAZ (Slovak University of Technology in Bratislava)
12:10 – 12:30	**Talk 16:** Assessment of Corrosion Behavior in Cold-Spray Deposited 316L Stainless Steel for Supercritical Water-Cooled Small Modular Reactors	Ricardo FERNANDEZ (Ciemat)
11:30 – 11:50	**Talk 17:** Testing of accident tolerant FeCrAl nuclear cladding alloy in severe conditions	Marton KIRALY (Centre for Energy Research)
12:50 – 14:50	**Lunch**	
Session 3c: Resistance to heavy liquid metal environments **Chair: Fanny BALBAUD (CEA)**		
14:50 – 15:10	**Talk 18:** Innovative Materials for Lead-cooled fast reactor: Alumina-Forming High-Entropy Alloys	Roger CASTELLOTE-ALVAREZ (CENIM-CSIC)
15:10 – 15:30	**Talk 19:** Liquid metal embrittlement sensitivity by lead and Pb-Bi eutectic of Face-Centered Cubic austenitic steels and Complex Concentrated Alloys	Ingrid PRORIAL SERRE (UMET)
15:30 – 15:50	**Talk 20:** High alloyed AFA development for LFR	Alfons WEISENBURGER (KIT)
15:50 – 16:10	**Talk 21:** Corrosion Behavior of Alumina-Forming Austenitic Steels in Liquid Lead and Lead-Bismuth Eutectic: Surface Treatment Effects and Modelling Insights	Serguei GAVRILOV (SCK CEN)
16:10 – 16:30	**Talk 22:** Design and assessment of Si enriched innovative alloys resistant to liquid lead corrosion	Lucas AUTONES (Newcleo)
16:30 – 16:50	**Talk 23:** From research to qualified materials data - Erich STERGAR	Erich STERGAR (SCK CEN)
16:50 – 17:20	**Discussion 3: Resistance to corrosive environments**	
17:20 – 19:00	**Session 4: Poster session with refreshment in Main Hall** See List of Titles on Pages 6 and 7	
19:00	**Adjourn**	

Wednesday, 2 April, CSIC Auditorium		
8:30 – 9:00	**Arrival/registration** (Hall)	
Session 5: Materials with potential for high temperature applications **Chair: Céline CABET (CEA)**		
9:00 – 9:30	**Invited 8:** Materials Research in Frame of GIF VHTR Materials Programme	Manuel POUCHON (PSI)
9:30 – 9:50	**Talk 24:** High Temperature Deformation and Mechanism of Alloy 800H and its Weldments in HTGR Applications	Wenjing LI (CNL)
9:50 – 10:10	**Talk 25:** In-situ observation of strain and stress in fine-grained nuclear graphite by high temperature disc compression	James MARROW (University of Oxford)
10:10 – 10:30	**Talk 26:** Microstructural Characterization of AGR-2 TRISO Particle Buffer, IPyC, and Buffer-IPyC Interfaces	Tanner Jason MAUSETH (INL)
10:30 – 10:50	**Talk 27:** Radiation-Induced Thermal Conductivity Degradation in SiC, ZrC, and ZrN Ceramics Cladding Studied via Transient Grating Spectroscopy	Han LIU (University of Manchester)
10:50 - 11:20	**Coffee Break**	
11:20 – 11:40	**Talk 28:** The formation of porosity in silicon carbide composites under He ion implantion	Douglas ANDREWS (UKAEA)
11:40 – 12:00	**Talk 29:** An innovative protocol for developing advanced fusion materials with high radiation resistance	Duc NGUYENMANH (UKAEA)
12:00 – 12:20	**Discussion 4: Materials with potential for high temperature applications**	
12:20 – 12:50	**Invited 9:** IAEA's Current Efforts in Advancing Nuclear Fuel Technologies	Anzhelika KHAPERSKAIA (IAEA)
12:50 – 14:50	**Lunch**	
Session 6: Panel – Materials challenges for advanced and small modular reactors: from the need for innovation to licensing **Chair: James MARROW (University of Oxford)**		
14:50 – 15:00	**Introduction to Panel Session**	James MARROW (University of Oxford)
15:00 – 15:30	**Panel Talk 1:** Materials for innovative reactors: interests and difficulties of an introduction in a nuclear code	Cecile PETESCH (CEA)
15:30 – 16:00	**Panel Talk 2:** newcleo's strategy for materials	Francisco GARCIA FERRE (newcleo)
16:00 – 16:30	**Panel Talk 3:** Addressing Materials Challenges for the Natrium Demo Reactor	Greg VETTERICK (Terrapower)
16:30 – 17:00	**Coffee Break**	
17:00 – 17:30	**Panel Talk 4:** Materials challenges for molten salts reactors	Jeremy RAME (Naarea)
17:30 – 18:00	**Panel Talk 5:** In-core materials selection for Thorizon ONE fast-spectrum molten salt reactor design	Nadia MAURICE (Thorizon)
18:00 – 18:30	**Panel Discussion: Materials challenges for advanced and small modular reactors: from the need for innovation to licensing**	Panel
18:30 – 20:00	**Extended Break**	
20:00	**Dinner** (separate registration required) at Restaurante Raimunda, 2 Paseo de Recoletos, 28014 Madrid https://grupolafabrica.es/raimunda	

Thursday, 3 April, CSIC Auditorium		
8:30 – 9:00	**Arrival/registration** (Hall)	
Session 7: Industrial application of nuclear structural materials **Chair: Marta SERRANO (Ciemat)**		
9:00 – 9:30	**Invited 10:** Research activity overview on nuclear structural materials in Korea	Dong-Jin KIM (KAERI)
9:30 – 9:50	**Talk 30:** The role of high temperature alloy performance for enabling advanced nuclear reactor technology	James STUBBINS (University of Illinois)
9:50 – 10:10	**Talk 31:** Polycrystalline Plasticity Analysis of Cyclic Loading and Stress Relaxation in 316H Austenitic Stainless Steel	Sadik Sefa ACAR (Middle East Technical University)
10:10 – 10:30	**Talk 32:** Simplified Statistical Method for Adjusting Embrittlement Trend Curves in Reactor Pressure Vessel Surveillance Data	Gyeong-Geun LEE (KAERI)
10:30 – 10:50	**Discussion 5: Industrial application of nuclear structural materials**	
10:50 – 11:20	**Coffee Break**	
11:20 – 11:50	**Invited 11:** Experience in Resolving Challenges in Assuring LTO from a Materials and Structural Integrity Perspective	William SERVER (ATI Consulting)
Session 8: Summary and conclusions **Chair: Céline CABET (CEA)**		
11:50 – 12:40	Session chair summary presentations	Session chairs
12:40 – 12:50	Closing remarks	
12:50	**Conference End**	

Structural Materials for Innovative Nuclear Systems (SMINS-7)

List of Posters		
NEA ID#	**Title**	**Presenting author**
40282	Phase-field modelling of formation and growth of intergranular and intragranular hydride in zirconium cladding	Kunok CHANG (Kyung Hee University)
40286	Corrosion Behaviour of Various SiC Ceramics in NaCl-$MgCl_2$ Molten Salt	Weon-Ju KIM (KAERI)
40322	Corrosion Behavior of Ni-201 and Inconel 625 in High-Temperature NaCl-$MgCl_2$ Molten Salt for MSR	Wonchan LEE (Hanbat National University)
40324	Phase-field Modeling of M6C to M12C Carbide Transformations in the Ni-Mo-C System	Woojien LEE (Kyung Hee University)
40325	Development of Ni-Cr-Mo-W alloy as a structural material for molten chloride salt reactor	Hyeon-Geun LEE (KAERI)
40326	Analysis of Flow Assisted Corrosion (FAC) in Small Modular Reactor (SMR) Pipes Using MOOSE Framework	Jeongho AN (Kyung Hee University)
40327	Corrosion Behavior of Ni-cladded Stainless Steel 316H in High-Temperature NaCl-$MgCl_2$ Molten Salt	Jeoung-Han KIM (Hanbat National University)
40331	Development of alumina-forming Ni-base alloys as structural materials for MCFR MCSR	KAERI colleagues on behalf of Chaewon KIM (KAERI)
40338	Corrosion Analysis of Copper Canisters using the MOOSE(Multiphysics Object Oriented Simulation Environment)	Myeongjin KANG (Kyung Hee University)
40340	Damage and Liquid Metal Embrittlement sensitivity of a CCA alloy in presence of liquid Pb and Pb-Bi	Jorge SALGADO GIAMPAOLI (Université de Lille)
40477	Initial Data on Coating Materials Exposed to Liquid Lithium Corrosion	Benjamin Mark JENKINS (UKAEA)
40480	Towards a better understanding of irradiation effects on the corrosion of model Ni-base alloys in a molten chloride salt	Jean-Baptiste PRUVO (CEA)
40574	Irradiation Performance of Ni-base Structural Alloys for Applications in Molten Salt Nuclear Reactor	F NAZIRIS (NRG)
40610	Radiation resistance of commercially produced titanium beryllide	Alexey DIKOV (Institute of Nuclear Physics, Republic of Kazakhstan)
40639	Heavy liquid metal experimental devices for material research	Rajesh JARUGULA (CV Rez) on behalf of Lucia ROZUMOVA (CV Rez)
40640	The investigation of the corrosion resistance of materials in conditions of the high temperature helium	Rajesh JARUGULA (CV Rez) on behalf of Lucia ROZUMOVA (CV Rez)
40659	Characterization of Deformation Mechanisms in Neutron Irradiated F/M Fe-Cr Alloys	James STUBBINS (University of Illinois)
40661	Irradiation Performance of Additively Manufacture 316H SS	James STUBBINS (University of Illinois)
40766	Advancements and Challenges in the Development of Structural Materials for Nuclear Applications	Tom OWINO (D-Orbital Ltd)
40851	Sequential High-fluence Helium Ion Irradiated Nuclear Steels Characterization by Positron Annihilation Lifetime Spectroscopy	Marek NOVAK (Slovenska Technicka Univerzita Bratislave)
40858	Nuclear Materials Atom Probe (NuMAP) – a dedicated UK-national user facility providing atom-scale fission/fusion materials characterisation	Paul BAGOT (University of Oxford)
40869	Innovative Scalable Solid Phase Manufacturing Methods to Accelerate Deployment of High Entropy Alloys for Reactor Core Applications	Isabella VAN ROOYEN (PNNL)
40872	Evaluation of DED and LPBF Fe-based Alloys Process Parameter Envelopes	Isabella VAN ROOYEN (PNNL)
40876	Exploring the early stages of proton irradiation damage in AlxCoCrFeNi HEAs	Christina HOFER (University of Oxford)
40878	Processing and Characterization of G91 Alloy Using LPBF: From Powder to Microstructure	Erick ALVARADO (CENIM-CSIC)
40879	Mechanical Performance of NiFeCrMn Alloy Under Tensile Loading: An Experimental and Atomistic Model	Francisco DOMINGUEZ GUTIERREZ (NOMATEN)
40886	ISS experiments of He implanted AISI-316L	Silvia GUERRA RODRIGUEZ (Ciemat)
40891	Advanced Steels for Gen IV Reactors: Balancing Corrosion Resistance and Mechanical Properties in Lead Environments	Facundo MASARI (Universidad Carlos III de Madrid)
40910	Corrosion behavior of novel 1Al-Sc-Y ODS Eurofer steel in static liquid lead environment at 600 °C	Rajesh JARUGULA (CV Rez)
41688	High Throughput Analysis of Thermally-Aged Reduced-Activation Ferritic-Martensitic Steels for Future Fusion Applications	Ben EVANS (UKAEA)

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41788	The Kinetics of Strain-Induced Martensitic Transformation and its Impact on Plasticity in Irradiated Austenitic Stainless Steels	Mikhail MEREZHKO (Institute of Nuclear Physics, Republic of Kazakhstan)
41799	Corrosion Degradation of EP-450 Ferritic-Martensitic Steel after Neutron Irradiation and Long-Term Storage	Diana MEREZHKO (Institute of Nuclear Physics, Republic of Kazakhstan)