



Editorial

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The 3rd Symposium N on Nuclear Materials of the European Material Research Society (EMRS) held at the EMRS 08 Spring meeting; Strasbourg – May 26–30, 2008, involved 125 experts from 19 countries dealing with specific nuclear topics in the following sessions:

- Materials for advanced fusion systems.
- Materials for spallation.
- Materials for reactors of generation IV.
- Structural materials for reactors of generations II and III.
- Fuel materials, fuel matrix and target for transmutation in reactors.
- Waste form materials for geological disposal or to be reprocessed.

The poster session acted as cement with a panorama on investigations on all these nuclear materials.

Over 5 days, 110 presentations (including posters) took place covering structural materials, fuels and waste forms from all nuclear systems. This application of basic nuclear chemistry and physics over the gamut of nuclear systems or materials ensures the success of Symposium N.

The Symposium was organized by Prof. Dr. Claude Degueldre (Paul Scherrer Institute, Villigen & University of Geneva, Switzerland), Dr. Michel Chatelier (Commissariat à l'Énergie Atomique, Cadarache, France), Prof. Dr. Thomas Fanghänel (Institute of TransUranium elements, Karlsruhe & University of Heidelberg, Germany), Prof. Dr. Bill Lee (Imperial College, London, UK), Prof. Dr. Eric van Walle (SCK.CEN, Mol & University of Leuven, Belgium) and Prof. Dr. Lars Werme (SKB, Stockholm & University of Uppsala, Sweden). Attendees were welcomed by Prof. Francesco Priolo (University of Catania, Italy) Vice President of the EMRS remembering its 25th anniversary. Claude Degueldre gave the introduction polarizing in two directions, the history of the nuclear material symposia at the EMRS and the scientific basis of the sessions.

The fusion material session was chaired by Michel Chatelier (Commissariat à l'Énergie Atomique, Cadarache, France) and Maria Samaras (PSI, Switzerland). The session dealt with Reduced activation ferritic/martensitic (RAFM/RAF) steels with their oxide dispersion strengthened (ODS) versions, SiC/SiC, SiC/C and C versions for light elements on the armor wall as well as tungsten on the divertor. Helium behaviour in the system remains a crucial point while stability under irradiation remains a key point for materials that have to undergo displacement damage rates of the order of 10 displacements per atom per year.

The spallation session also took place on the first day. Lars Werme (SKB, Sweden) and Charlotte Becquart (University of Lille, France) chaired this small session. It focused on the two spallation systems in Europe: Megapie and Myhrra. These systems deal with liquid metal target, respectively, with or without window between the accelerator and target.

The second day session was chaired by Claude Degueldre (PSI, Switzerland) and Marie-France Barthe (University of Orleans, France) and concerned 'generation IV' materials, starting with iron, ferritic steel, other metals (molybdenum) and advanced ceramics such as silicon carbide. Compared to 'generation II' reactors the temperature (800–1300 K) may be double and the damage rate an order of magnitude greater during operation in these systems. Most of the six GIF reactors were covered except the molten salt reactors.

The session on 'generations II and III' materials was overseen by Eric van Walle (SCK.CEN, Belgium) and Mercedes Hernandez Mayoral (CIEMAT, Spain). The materials ranged from reactor pressure vessel steels to zirconium alloys.

The fourth day concerned the fuel. The fuel session was chaired by Rosa Yang (EPRI, USA) and Joseph Sommers (ITU, EU). The session started with UO₂, MOX, MA-MOX, followed by composite fuels and an afternoon focusing on inert matrix fuels, carbides and nitrides. The fuels undergo damage rates of 10 displacements per atom per year, and are operating at temperatures that should not exceed 50% more than that of the coolant.

The waste form session was chaired by Bill Lee (Imperial College, UK) and Cecile Ferry (CEA, France) and dealt with spent fuels, various crystalline wastes and glasses. In the geological disposal system they will undergo damage rate of 10⁻² displacement per atom per year. Here corrosion problems are crucial over periods of the order of 10⁴ a.

The poster session was introduced by the chairs: Virginia Oversby (VMO Konsult, Sweden) and Neil Hyatt (University of Sheffield, UK) with a preview displayed in a very versatile and dynamic way. The session was also visited by the participants who elected the best poster which was awarded to Kathelijnn Verhiest from SCK.CEN, Mol, Belgium, for a study on ODS iron fabrication and characterization.

The student award of Symposium N was given to Emily Corcoran from the Royal Military Institute of Canada, Kingston, Ontario for a work on burnable absorber rod to be implemented in an advanced Candu reactor fuel element for safety reason. This work deals with quaternary stabilized zirconia, cocktail of burnable absorbers and utilization of GEM code for a reactor of generation III.

Over the range of studies presented at the meeting, the behaviour of noble gases in nuclear materials emerged in nearly all sessions. This includes helium in iron structural materials as well as uranium dioxide fuel in pile or in waste forms as well as other fission gases in several metal and ceramic phases and from high to quasi room temperature. These studies are driven by modeling or experimental work separately or by both in the most versatile studies.

The papers presented in these proceedings are not in the original order of presentation during the symposium. They are ordered following the series of sessions and going from simple to composite systems.

The results presented during Symposium N are believed will contribute to making the use of Nuclear Materials safer, more sustainable, economical and ecological.

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