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Book of Abstracts

Only accepted abstracts are presented in the book.

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Mechanical and structural properties of RAFM steels - Impact of radiation damage

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Reduced activation ferritic/martensitic (RAFM) steels are the main candidates for the construction of structural components in future nuclear reactors. RAFM-based materials require a careful approach for their selection and characterization, as they must ensure safe and stable employment of a nuclear device over its full lifetime. Constantly enduring neutron irradiation, high temperatures, and mechanical stresses, the structural materials tend to degrade their mechanical properties. As neutron irradiation for research purposes is a long, expensive, and complicated process, the nuclear materials scientific community is increasingly looking towards an attractive solution of ion irradiation. We propose to establish a computationally experimental protocol built around high-temperature nanoindentation experiments, electron microscopy techniques, and finite element method to characterize the plastic properties of metallic materials after ion irradiation, serving as a surrogate for neutron damage.

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Stress Corrosion Cracking Behaviour of Thermally Aged Alloy 182

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To understand the effects of long-term thermal ageing on stress corrosion cracking (SCC) of alloy 182 in nuclear power plants, thermal ageing of as-welded alloy 182 was performed at 400 ℃ for 800 h, 2400 h, and 5500 h. Stress corrosion cracking initiation as well as crack growth tests were conducted in hydrogenated high-temperature water. SCC initiation was not affected by thermal ageing, but the number of tests were too low to make statistically sound conclusions. The SCC crack growth rates were moderately lower in thermally-aged samples. However, the differences in growth rates were diminishing with more aggressive testing conditions (higher temperature and KI). There is thus no evidence for adverse effects of thermal aging on SCC in Alloy 182 in long-term operation.

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High resolution digital image correlation for advancing the crystal plasticity modelling of nuclear reactor materials

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The plastic behavior of irradiated materials used in nuclear reactors can be modelled by describing it via constitutive equations capturing the important contributing factors. To reflect the microstructural context, the flow stress must be decomposed into its fundamental components associated with the microstructure features peculiar to the particular steel, such as carbides, the dislocation network, deformation confinement inside grains, and strain localization in cleared channels. To study strain localization in particular, at VTT we are developing high resolution digital image correlation techniques for employment with in situ tensile testing in the SEM chamber, to capture the manifestation of the local deformation behavior on a sub-grain scale. The captured images are quantified, and the results are then employed to improve, parameterize and verify the crystal plasticity modelling approach VTT is employing for grain scale calculations as part of the overall multiscale modelling approach.

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CERAD project and 30 MeV cyclotron for medical isotope production in Poland

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CERAD project - Center of Design and Synthesis of Radiopharmaceuticals for Molecular Targeting is the new research facility being built at NCBJ/POLATOM. Its main component is a 30 MeV cyclotron (Cyclone 30XP, IBA) which will accelerate protons and alpha particles to 30 MeV and deuterons to 15 MeV. This powerful tool will be employed for the production of novel radioisotopes for medical use, which were not available in Poland up to today such as F-18, Sc-44/43, Cu-64, Cu-67, Ge-68, Zr-89, I-123, and At-211. Installation of a new high-current cyclotron at NCBJ, with equipment and infrastructure combined with an already existing scientific base, creates unique and pro-development research capabilities, offering new possibilities to design innovative radiopharmaceuticals.
The CERAD project has found its place on the Polish Roadmap of Large Research Infrastructure.
This project is co-financed under the Smart Growth Operational Programme 2014-2020, Priority IV: INCREASING THE RESEARCH POTENTIAL, Measure 4.2. Development of modern research infrastructure of the science sector.