

VELLA



{Virtual European Lead LAboratory}



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VELLA THEMATIC WORKSHOP

MATERIAL ISSUES ON HLM COOLED NUCLEAR SYSTEMS (MIHNEAS)

Karlsruhe, Germany, 12-14 November 2008

Annette Heinzel, FZK



The VELLA Thematic School on “**Material issues on HLM cooled nuclear systems**” was held on November 12-14, 2008 at Karlsruhe. The school was organized by the Forschungszentrum Karlsruhe and sponsored by the EC-project VELLA. The purpose of the school was to give an overview on material issues for HLM cooled nuclear reactors and to present the current status of the related research, since the development of structural materials is one of the key issues for such HLM cooled nuclear systems. HLM induced embrittlement, corrosion and erosion as well as high dose irradiation combined with thermal and mechanical loads are the challenging conditions materials have to face.

The school was divided in three days. At the first day design and safety issues for LFR and ADS were introduced as well as the fundamental irradiation phenomena and performance of materials in irradiation tests. The second day dealt with corrosion, corrosion protection and with the analysis of mechanical property changes in HLM. The day ended with a presentation on MEGAPIE. The last day gave the attendants the opportunity to discuss their research work in short presentations. A visit of the Forschungszentrum Karlsruhe with the Synchrotron Light Source ANKA and the Karlsruhe Lead Laboratory (KALLA) including the loop test facilities CORRIDA, THESYS, THEADES and the facilities for test in stagnant Pb/PbBi COSTA as well as GESA (pulsed electron beam facility for surface treatments) concluded the school.

Program:

Design for LFR and ADS

Luciano Cinotti (Del Fugo Gierra Energia S.p.A., Italy)

Safety issues for LFR and ADS

Dankward Struwe (FZK, Germany)

Material classification and selection for application in ADS and fast nuclear systems

Al Mazouzi Abderrahim (SCK-CEN, Belgium)

Irradiation behaviour: fundamental issues (neutron irradiation)

Anton Möslang (FZK, Germany)

Irradiation behaviour: state of the art

Al Mazouzi Abderrahim (SCK-CEN, Belgium)

Design and material licensing for sodium cooled nuclear systems

Dr. Fhrad Tavassoli (CEA, France)

Wrap up session

Concetta Fazio (FZK, Germany)

Material compatibility with HLM, Experimental facilities for corrosion and results

Jürgen Konys (FZK, Germany)

Material corrosion in HLM: fundamental issues and state of the art (theoretical description of corrosion mechanism, Oxidation models)

Laura Martinelli (CEA, France)

Corrosion barrier development

Alfons Weisenburger (FZK, Germany)

Mechanical properties: fundamental issues and results (Part A)

Jean-Bernard Vogt (University of Lille, France)

Mechanical properties: fundamental issues and results (Part B)

Jean-Bernard Vogt (University of Lille, France)

MEGAPIE (Megawatt Pilot Target Experiment)

Hajo Heyck (PSI, Switzerland)

Wrap up session

Georg Müller (FZK, Germany)

The workshop was attended by 20 participants from 10 countries. The average age was 28 while the youngest was 21. All attendances were fully satisfied with the chosen topics and their presentation. Especially the wrap up sessions at the end of the first and second day helped to gain a better understanding of the presented matter.

THE INTERNATIONAL VELLA THEMATIC WORKSHOP

INTRODUCTION TO THE DESIGN ISSUES OF LFR

Bologna, Italy, 30 June – 2 July 2009

Federico Rocchi, UNIBO



The **International VELLA Thematic Workshop** 2009 “Introduction to the Design Issues of LFR” has been held at the Nuclear Engineering Laboratory of Montecuccolino of the University of Bologna on June 30th, July 1st and 2nd 2009. The event was organized by ENEA, in collaboration with the University of Bologna, through its Alma Mater srl, and with SINTEC srl. The twofold aim of the Workshop was on one side to present the state of the art in the scientific and technological development of Gen-IV lead fast reactors by special emphasis on the issues still open, and on the other side to give to young students or researchers a wide picture of the characteristics of LFRs and of the related problems.

The main idea of the organizers was to try to provide knowledge in every field of reactor design, involving then not only material scientists, but experts in the broadest areas of research. In this way it was possible to present a rather complete overview of LFR which could be not only accessible but also useful to people having many different scientific or technical backgrounds. The afternoon of June 30th was dedicated to the official welcome address by the guest of the event, prof Marco Sumini (University of Bologna); to an overview of the VELLA initiative by dr Alessandro Gessi (ENEA); to an introduction to Gen-IV systems by dr Luciano Cinotti (Del Fungo Giera); to the presentation of the main LFR concepts by prof Craig Smith (LLNL);

and to a description of the European research area on HLM nuclear systems by dr Silvia De Grandis (SINTEC srl). The first half of the morning of July 1st was spared for reactor physics: dr Federico Rocchi (University of Bologna) gave an introduction to the physics of fast reactors; dr Giacomo Grasso (University of Bologna) illustrated the main pathways in the neutronic design of LFR. The second half of that morning welcomed a very detailed presentation on the thermo-hydraulics issues by dr Robert Stieglitz (FK). In the afternoon dr Concetta Fazio (FZK) spoke about the corrosion and the thermochemistry of coolants; prof Federico Perotti (Politecnico of Milan) concentrated on structural mechanics, while dr Abderrahim Al Mazouzi (EDF) lectured about the mechanical properties of materials and the irradiation consequences. The day was nicely concluded with a joyful social dinner. The last morning of the workshop on July 2nd, witnessed the presentation by dr Alessandro Alemberti (Ansaldo Nucleare) on the system integration, with special emphasis on the ELSY concept, and the concluding, detailed lecture on the safety issues by dr Dankward Struwe (FZK). About sixteen young persons attended the workshop, half of which were graduate students of the second-level postgraduate course in Advanced Reactor Design and Management of the University of Bologna. Open discussion, from time to time even strong discussion, improved the exchange of opinions among all the participants, however always without breaking the delightful atmosphere provided by the nice location of hills of Montecuccolino. The audience, together with the very detailed, updated and interesting lectures delivered, contributed to the success of the workshop, especially as regards the fulfillment of the aforementioned, twofold aim. The picture that appeared from the presentations given is that great expectations are positively put worldwide “on the shoulders” of LFRs, while still some problems in the areas of corrosion of steels and of safety need to be addressed and solved. Nonetheless the great many efforts which are deployed with enthusiasms by all the researchers is indeed a good sign to foresee the future success. The overall success of this workshop could well be the input for the organization of future similar initiatives to be held on a regular basis.