

## Preface

The international Workshop on Materials for Heavy Liquid Metal Cooled Reactors and Related Technologies, held in Rome on May 21–23rd, 2007, in its fourth edition after Karlsruhe 1999, Brasimone 2001, Rome 2003, has become – one of the most important forum for scientific and technological discussion on Heavy Liquid Metals (HLM) for nuclear applications.

Presently, the use of pure lead, as well as its alloys (such as lead–bismuth, lead–lithium), is foreseen in several nuclear-related fields, i.e. it is studied as coolant for critical and sub-critical nuclear reactors, as spallation target for neutron generation – and for tritium generation in fusion systems.

More in detail, the use of lead as coolant appears to be an appealing choice for critical reactors: in the generation IV nuclear reactors technology evaluation, Lead Fast Reactor – (LFR) is a promising technology, top ranked both in sustainability because of the closed fuel cycle and in proliferation resistance and physical protection due to the expected long life core.

Moreover, the possibility to use HLM both as a neutron spallation target and coolant of the sub-critical part of the Accelerator Driven Systems (ADS) seems also very attractive, the ADS being proposed as a viable solution to reduce the radiotoxicity of nuclear wastes.

The MEGAPIE project, in the frame of which a liquid lead–bismuth neutron spallation target of a 1 MW total power has been designed, constructed and irradiated, has indeed demonstrated the feasibility and safe operation of this kind of neutron spallation source.

Finally, slowly flowing lead lithium alloy in eutectic composition (Li 15.7 at.%) is considered as tritium breeder and neutron multiplier of one of the two EU blanket concepts to be tested in ITER.

Given, therefore, all the abovementioned possible future use of liquid lead and its alloys in nuclear systems, a deep knowledge of its physics and engineering is needed; as a consequence, a large effort at both national and international level is dedicated to the HLM technologies.

The IV Workshop on Materials for HLM cooled Reactors and Related Technologies, has represented a fruitful opportunity to exchange information on the status of the research activities in progress within different laboratories and R&D programmes as well as to exchange experience on the most relevant structural materials and technologies for the operation of nuclear systems with Heavy Liquid Metals.

Presentations has been focused on the most critical research and development requirements for the deployment of HLM nuclear systems and the major achievements as well as the key open points in several fields (corrosion and mechanical properties of structural materials, physical/chemical properties of HLM and impurities control, thermal-hydraulics, irradiation and safety) have been enlightened.

The remarkable participation in this appointment, around 90 researchers from sixteen Countries, and the quality of the presented contributions have offered an opportunity rather unique for a critical and complete review of the ‘state of the art’ in the different areas of investigation related to the HLM nuclear systems mentioned above, as well as for a fruitful exchange of information and insight on the possible future studies and developments.

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