Profile LFR-29

CORELLA

GERMANY

GENERAL INFORMATION

NAME OF THE FACILITY	Corrosion Erosion Test Facility for Liquid Lead Alloy
ACRONYM	CORELLA
COOLANT(S) OF THE FACILITY	PB, LBE
LOCATION (address):	Karlsruhe Institute of Technology (KIT) Institute for Pulsed Power and Microwave Technology (IHM) Hermann-von-Helmholtz-Platz 1, Bldg 630 76344 Eggenstein-Leopoldshafen Germany
OPERATOR	KIT
CONTACT PERSON (name, address, institute, function, telephone, email):	Dr. Georg Müller Karlsruhe Institute of Technology (KIT) Deputy Institute Director +49 721 608 24669 georg.mueller@kit.edu

STATUS OF THE FACILITY In operation
Start of operation (date): 2009

MAIN RESEARCH FIELD(S)

- ☐ Zero power facility for V&V and licensing purposes
- ☐ Design Basis Accidents (DBA) and Design Extended Conditions (DEC)
- ☐ Thermal-hydraulics
- ☐ Coolant chemistry
- ☒ Materials
- ☐ Systems and components
- ☐ Instrumentation & ISI&R

TECHNICAL DESCRIPTION

Description of the facility

The CORELLA facility is used to expose specimens to rotating liquid metal for the investigation of combined erosion / corrosion stability of materials. It is a two container concept, one for conditioning of the liquid metal and the other for the corrosion/erosion tests.

The entire facility is designed for tests in lead having a temperature up to 650°C and oxygen concentrations from 10^{-10} to 10^{-4} wt%. The conditioning of the lead is performed in the conditioning

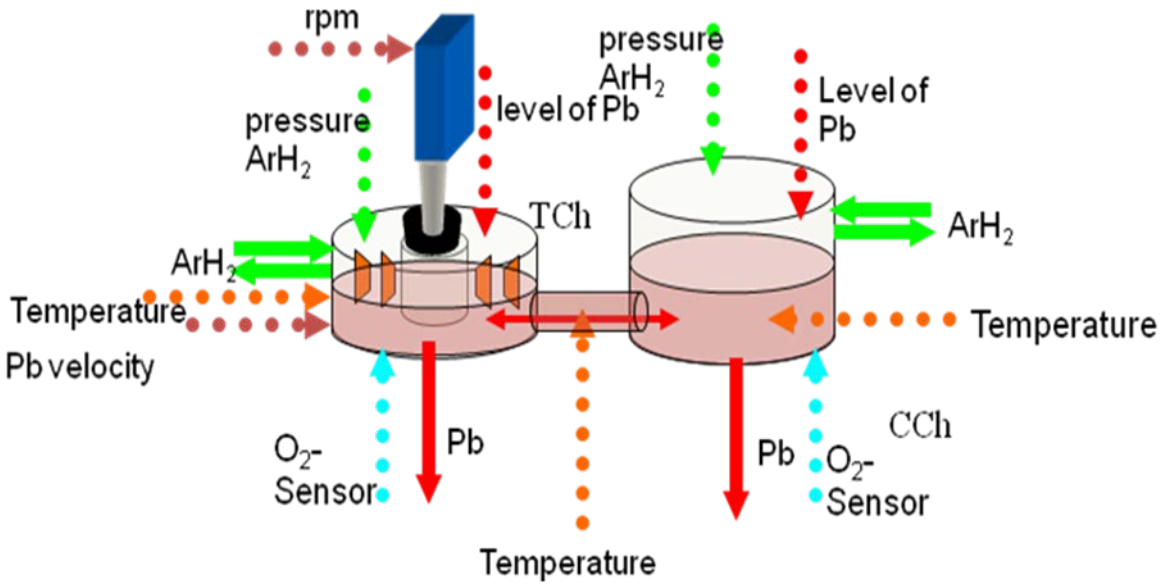
container equipped with a magnetic coupled stirrer to accelerate the oxygen transport from the lead to the gas phase. The lead is transferred by a tube to the experimental container that contains a magnetic coupled high performance stirring system that generates flow velocities up to 20m/s

Main research interest of CORELLA is:

- Corrosion studies
- Effects of hydrodynamic on corrosion using a rotating inner cylinder
- Test of selected pump materials

Acceptance of radioactive material
No

Scheme/diagram



3D drawing/photo

Parameters table

Coolant inventory	15l
Power	7kW heating power
Test sections	
TS #1	*Characteristic dimensions* Up to 5 specimens, equal flat plates of 60 x 15 x 1,5 mm^3 size can be adapted
	Static/dynamic experiment dynamic
	Temperature range in the test section (Delta T) 150°C - 650°C isothermal
	Operating pressure and design pressure ambient
	Flow range (mass, velocity, etc.) up to 15m/s – flow highly turbulent and inhomogeneous
Coolant chemistry measurement and control (active or not, measured parameters)	active oxygen control system using Pt/air sensors and gas exchange
Instrumentation	temperature sensors oxygen sensors pitot tube

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

In EU project LEADER Grant agreement no. FP7-249668 several dedicated pump steels and ceramics like SiSiC tested at 480°C with 10m/s velocity

PhD to develop the facility and do some 1st test

New Maxphases and steels, also coated or surface alloyed, in EU project MATISSE Grant agreement no: 604862.

PLANNED EXPERIMENTS (including time schedule)

Austenitic steels and surface coated and surface alloyed steels in the EU project GEMMA Grant agreement no:755269– to explore influence of different flow velocities.

TRAINING ACTIVITIES

Training activities are possible, depending on availability and after prior agreement under supervision of KIT.

REFERENCES (*specification of availability and language*)

Liquid metal corrosion/erosion investigations of structure materials in lead cooled systems: Part 1 M. Kieser, H. Muscher, A. Weisenburger, A. Heinzel, G. Müller, Journal of Nuclear Materials Volume 392, Issue 3, 1 August 2009, Pages 405–412

Deliverable 16 of EU project LEADER "Erosion stability of materials in fast flowing lead" by Alfons Weisenburger KIT

Interaction of M;n+1AXn Phases with Oxygen-Poor, Static and Fast-Flowing Liquid Lead-Bismuth Eutectic; Jozef Vleugels, Konstantina Lambrinou, Bensu Tunca Altintas, Alfons Weisennburger, Adrian Jianu, Jasper Joris, Renate Fetzer; Journal of Nuclear Materials, to be published