Karlsruhe Institute of Technology

Institut für Neutronenphysik und Reaktortechnik
Anlagenentwicklung, Systemdynamik und Sicherheit

HELMHOLTZ ASSOCIATION

LIMTECH Alliance *and HEMCP: Helmholtz Energy Materials Characterization Platform*

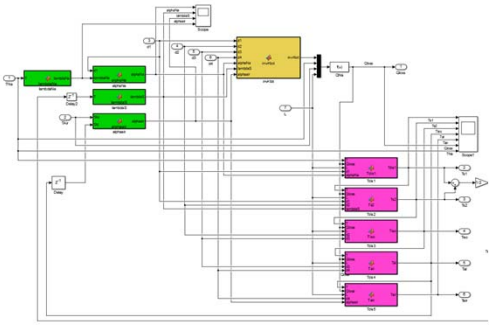
B4: Phase changes in liquid metals for direct energy conversion

Alkali Metal Thermal to Electric Converter (AMTEC)

N. Díez de los Ríos, A. Onea, A. Weisenburger, M. Lux, W. Hering, R. Stieglitz

Status AMTEC TEst FAcility (ATEFA)

- ✓ Metallic structure built and thermally isolated
- ✓ Ar-side of ATEFA assembled
- ✓ First Na-transport cask finished (TC, heating trace and thermal isolation)
- ✓ Cooling system of AMTEC cell and AMTEC laboratory designed
- ✓ Software in Matlab-Simulink for simulation of temperature control in trace heating developed



Subsystem of the temperature control-Software in Matlab-Simulink

Main goals 2015

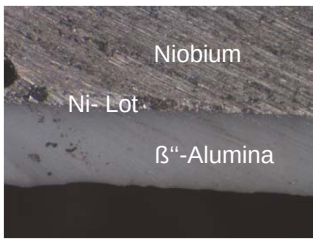
- Trace heating system control
- Software for control system of ATEFA
- Set into operation of ATEFA → Na test
- Software in Matlab for AMTEC process simulation
- First measurement campaign

Main goals Q1 – 2016

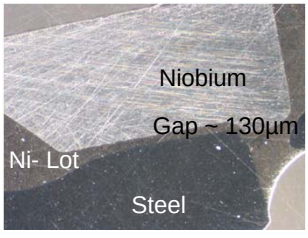
- Characterization of various BASE-sputter layers
- Compatibility of structure materials in high temperature Na
- Evaluation of AMTEC cell (thermo-dynamic, -electric process, performance, efficiency)

Evaluation test for material and process selection

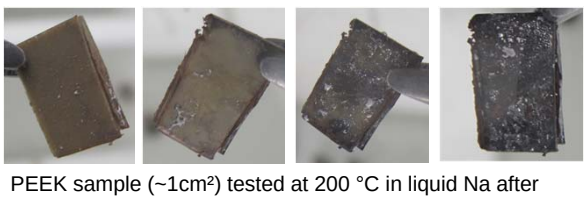
- ✓ Electrode sputtering tests extended to further materials (Mo, TiN)
- ✓ Nb – steel joining tests successful
- ✓ ß‘‘-Alumina – Nb joining tests started
- ✓ Sealing tests for TC feedthrough ongoing (200 °C, high tightness)
- ✓ Scoping test of PEEK chemical stability in Na finished
- ✓ Valves tested on pressure and leakage



ß’’-Alumina – Nb sealing test



Nb – steel sealing test



PEEK sample (~1cm²) tested at 200 °C in liquid Na after 5, 15, 30 minutes and 1 hour*

Thermocouple feedthrough of AMTEC cell

*N. Diez de los Rios et al., Proceedings IYCE2015