PAUL SCHERRER INSTITUT

PSI

Didier Gavillet :: Department Hot Laboratory :: Paul Scherrer Institut

Department Hotlabor

NES Event, 18.10.2016

Outline of the presentation

- Legal framework (Betriebsbewilligung)
- Mission and organisation of the department
- Core competences
- Projects
- Short conclusion

Legal Framework

- All requirements for the renewal of the operation license have been implemented
- ENSI has delivered a positive review of the safety of the hot laboratory
- There was no objection from the local community or the canton to the renewal of the license
- BFE is writing the new license
- We expect the new license end of this year or beginning of next year

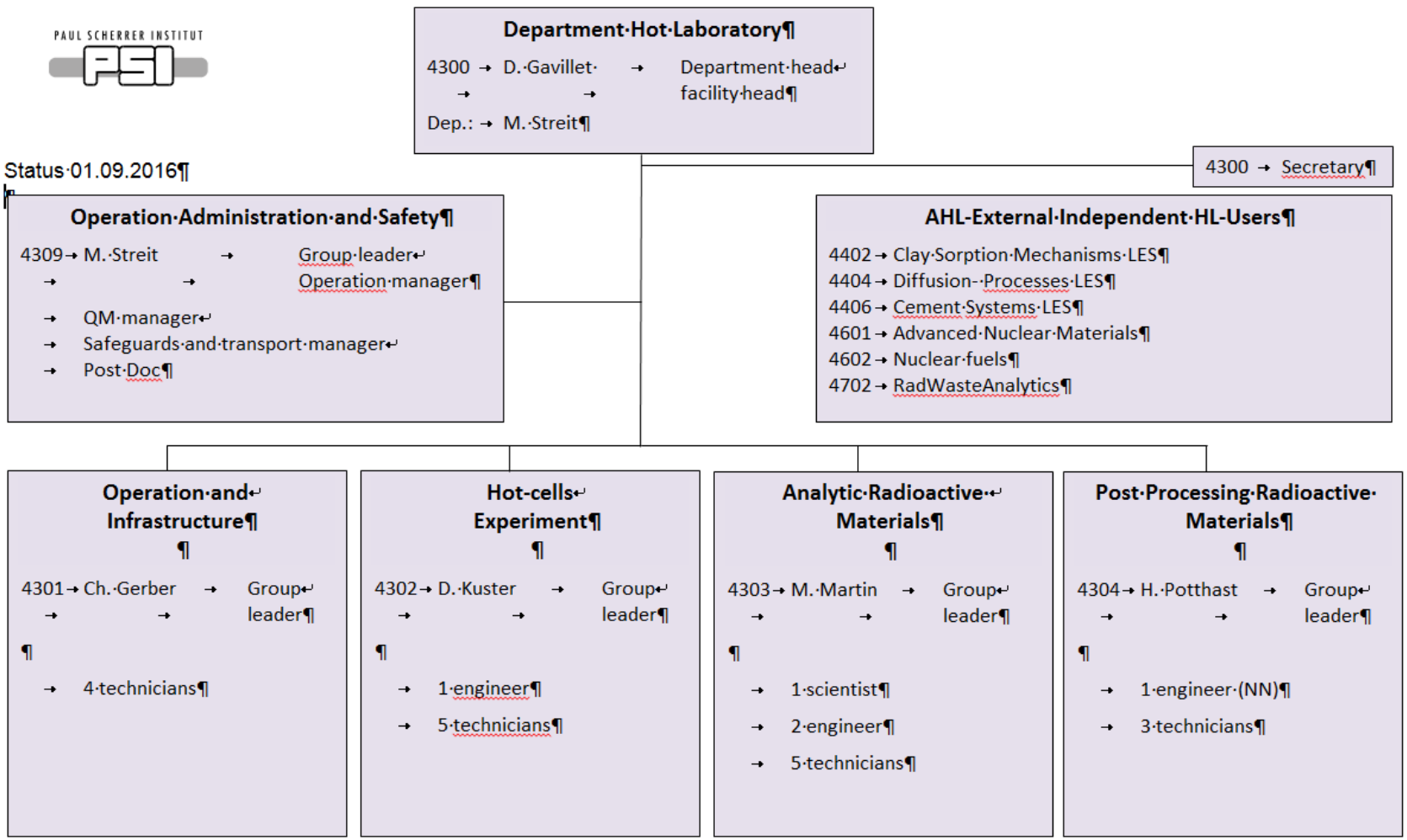
AHL Mission

- safe and efficient operation of the Hot laboratory
- Swiss competence centre for the handling and analysing of highly radioactive materials including nuclear fuel
- contributes to the safe operation of the Swiss power plants
- supports PSI and external research groups for the handling, the preparation and the analysis of radioactive specimens
- develops and improves its analytical methods in the interest of the users of the lab

AHL Organisation

- Beginning of 2016, the department was reorganized with the following goals:
  - More efficient treatment and conditioning of the waste in the hot laboratory
  - Better support of all users of the lab (clarification of the interfaces)
  - Decrease the overloading of key positions

AHL Organisation



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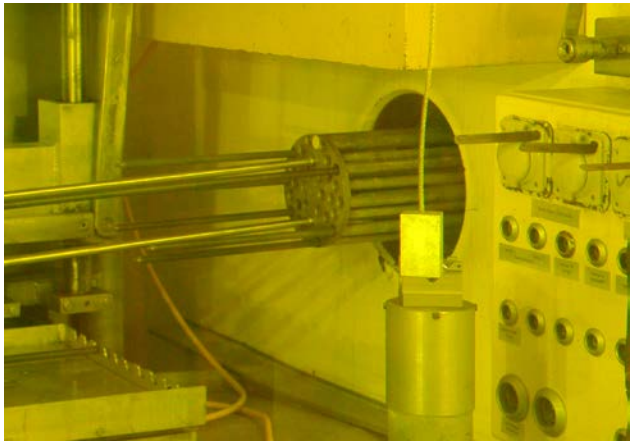
Core competences and projects

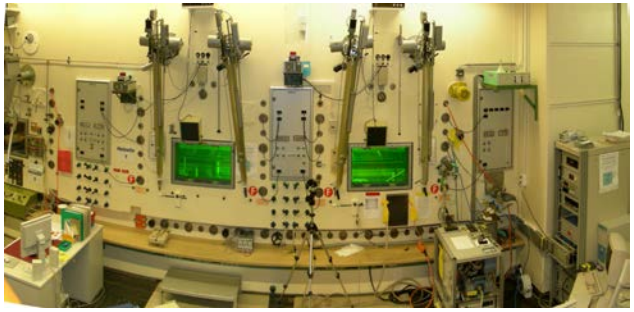
AHL core competences

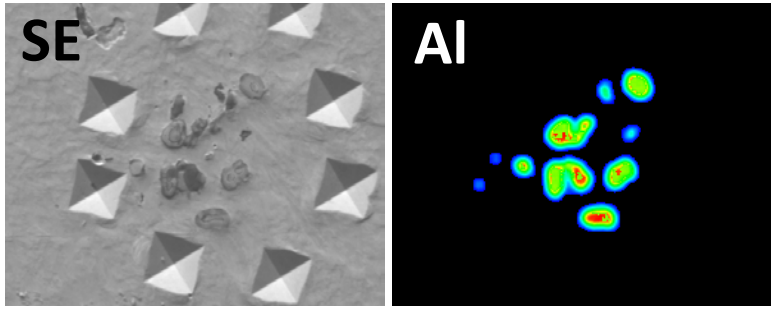
- Operation of a nuclear facility / Safety culture
- Handling, investigation and conditioning of highly radioactive materials
- Preparation and analytical investigation of radioactive materials (structure, chemical composition, material isotopic composition, failure mechanisms, …)
- Support to nuclear operators in Switzerland (Readiness and flexibility)

PIE of core reactor materials

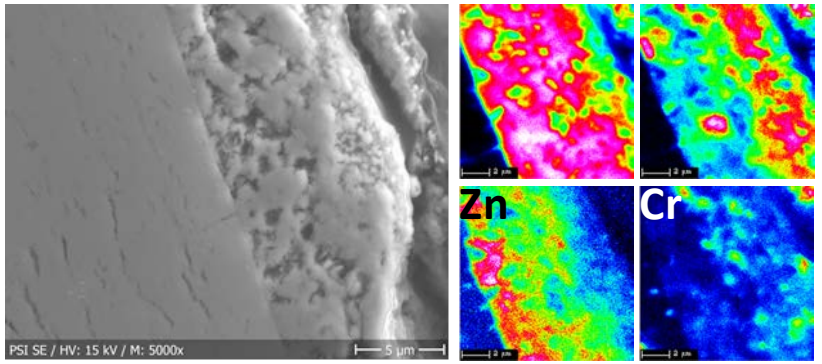
Handling* and PIE







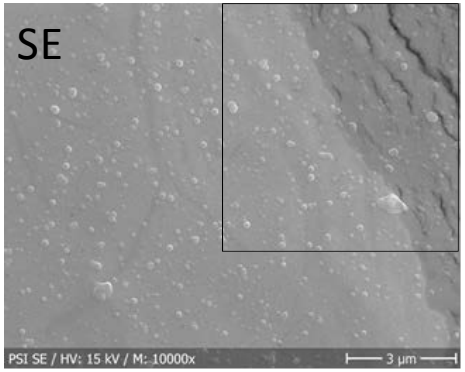
KKB RDB-steel investigation



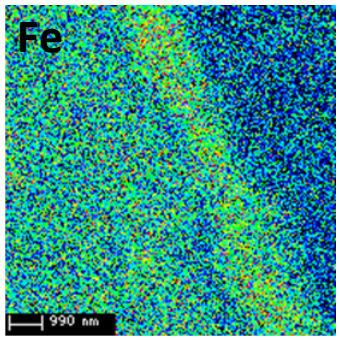
BWR CRUD investigation

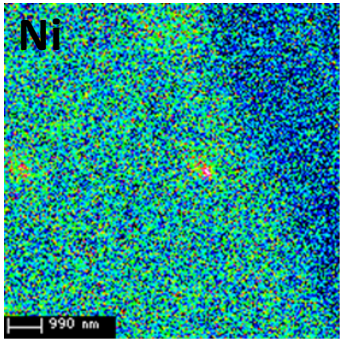
** One of the last Western European lab with a long term capability to handle full length rods*

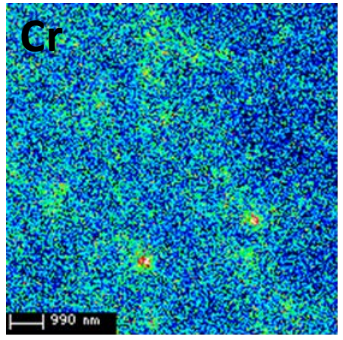
Analysis of radioactive materials

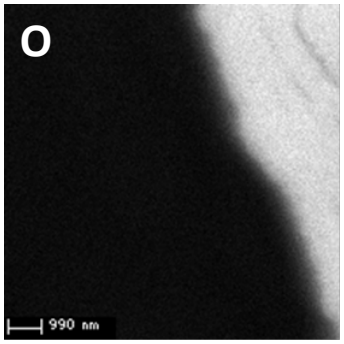


- Specimen preparation for scientific analyses of highly irradiated materials
- Structure and chemical analyses of irradiated fuel and cladding materials
- Basic information for further analyses on PSI large facilities

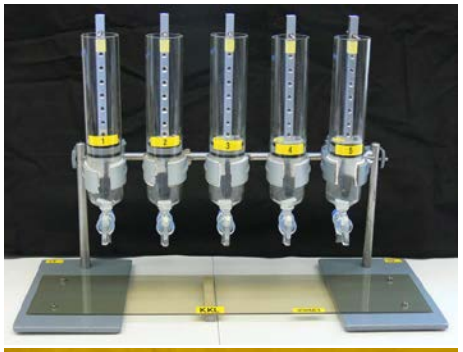


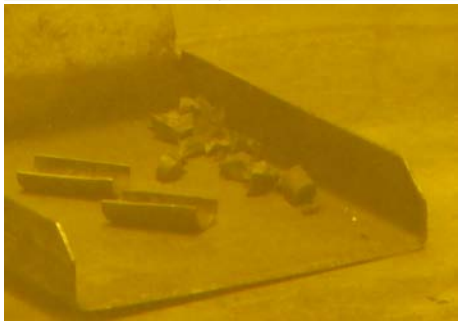






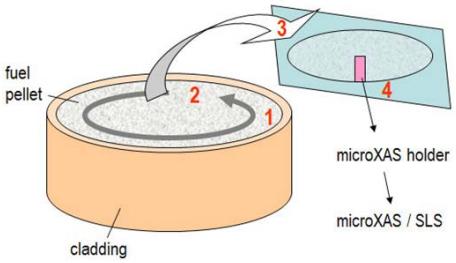
Support and collaboration with lab users



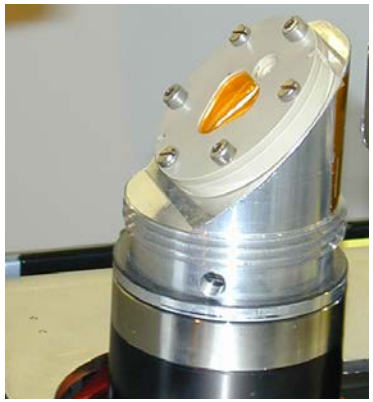


Collaboration with LES
(FIRST Nuclide project / E. Curti)

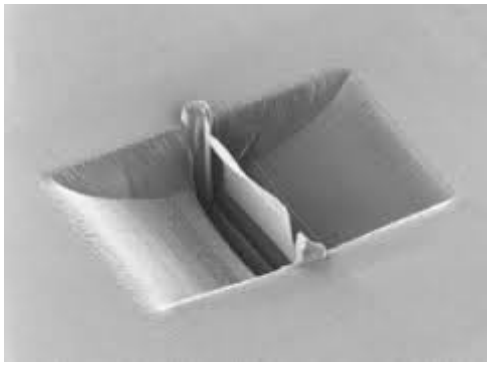
- Leaching fuel material to study the fission product behavior in repository
- Specimen preparation developed and realized in the Hotlab
- Production of very small specimen for investigation at SLS

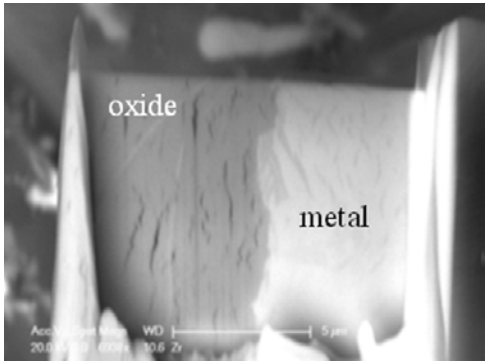


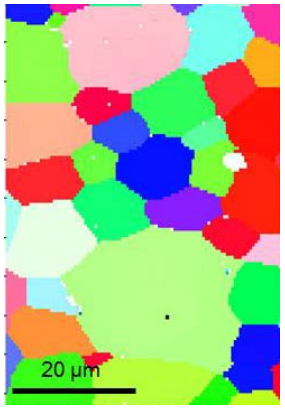
Specimen peeling



Investing for better specimen preparation







EBSD Pattern Example
CEA Analysis / C. Cagna Phd

SEM and Focus Ion Beam for highly radioactive materials*

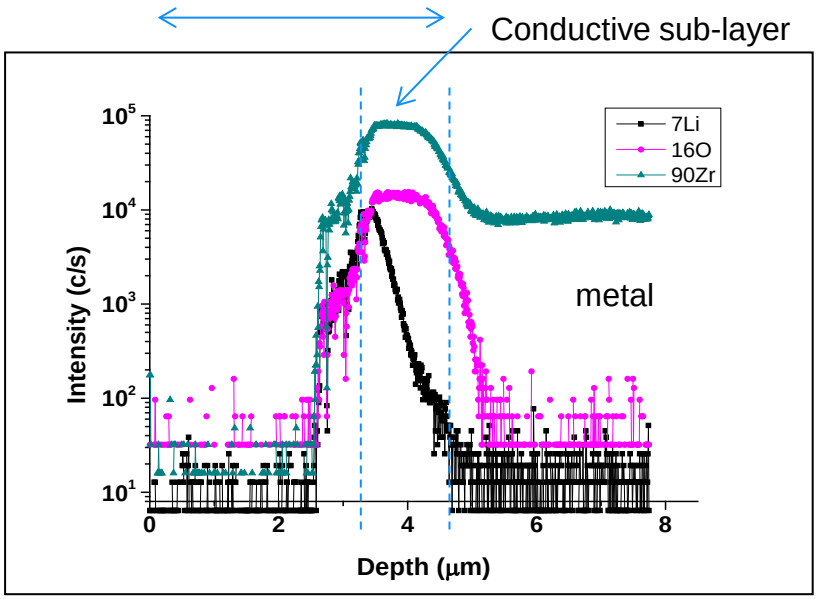
- Micro-specimen extraction at precise location
- Specimen preparation at interface
- Shaping for mechanical test
- Analysis Methods in the SEM
  - *SE, BSE imaging*
  - *EDS / WDS Analysis*
  - *EBSD Pattern with 3D Analysis*

* AHL and LNM common investment with SNF support (R-Equip)

Future work and projects

$$t_{1/2} = \frac{\ln(2)}{A_{^{60}Fe}} \times \frac{N_{^{60}Fe}}{N_{Fe}} \times N_{Fe}$$

Half life determination of ^{60}Fe



- Post Irradiation of KKL & KKG rods
- Post irradiation analysis of ATF-materials irradiated in KKG*
- Support to LNM for Swissnuclear research projects
- Support of Users for research projects (f. exp. 1/2 life determination / clad conductivity, PWR-CRUD, …)

- Installation and commissioning of the FIB
- Installation and commissioning of a new MC-ICP-MS
- Further refurbishment of the hot laboratory

Conclusions

Conclusion

HOTLAB is a key facility for NES, the PSI and Switzerland

- As the Swiss center of competence for the handling and analysis of highly radioactive materials
- As a key tool for research groups using radioactive materials

Knowhow, experience and safety culture
makes the success of the hot laboratory in PSI

My thanks go to

- My team (AHL)
- Swissnuclear (Sockelbeitrag)
- PSI direction

For their work and support

Thanks for your attention