Joint Research Centre
Institute for Transuranium Elements

Thierry Wiss

4th UK Nuclear Academics Discussion Meeting

University of Sheffield
8th and 9th September 2015

https://ec.europa.eu/jrc

Serving society
Stimulating innovation
Supporting legislation

Joint Research Centre

The JRC inside the European Commission

President
Jean-Claude JUNCKER

28 Commission Members
(president, 7 vice presidents + 20 commissioners)

Commissioner for Education, Culture, Youth and Sport
Tibor Navracsics

Director-General
Vladimír Šucha
Joint Research Centre

DG Education and Culture

JRC Research areas

Agriculture and food security

Economic and monetary union

Energy and transport

Environment and climate change

Health and consumer protection

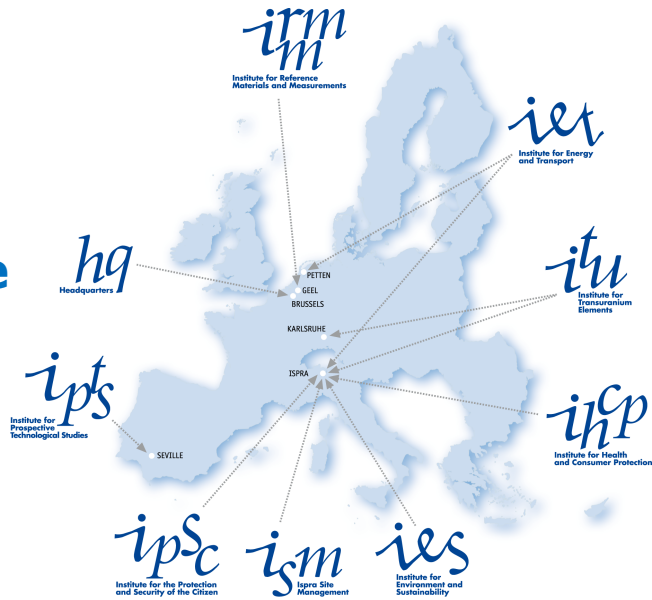
Information Society

Innovation and growth

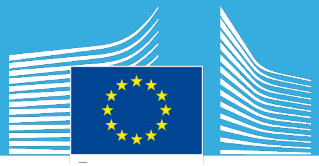
Nuclear safety and security

Safety and security

Standards



Partners & Stakeholders



European Commission

CONSILIUM

ITRE Industry, Research and Energy
European Parliament

IAEA
International Atomic Energy Agency

Scientific and Technical Committee (STC) Euratom

DG JRC

Nuclear safety and security

Advisory Board JRC BoG

NEA OECD
Nuclear Energy Agency

European Nuclear Energy Forum
Bratislava - Prague

EERA
European Energy Research Alliance

IGD-TP

GEN IV International Forum

ENSREG
European Nuclear Safety Regulators Group

SNETP
Sustainable Nuclear Energy Technology Platform

Joint Research Centre

JRC - ITU

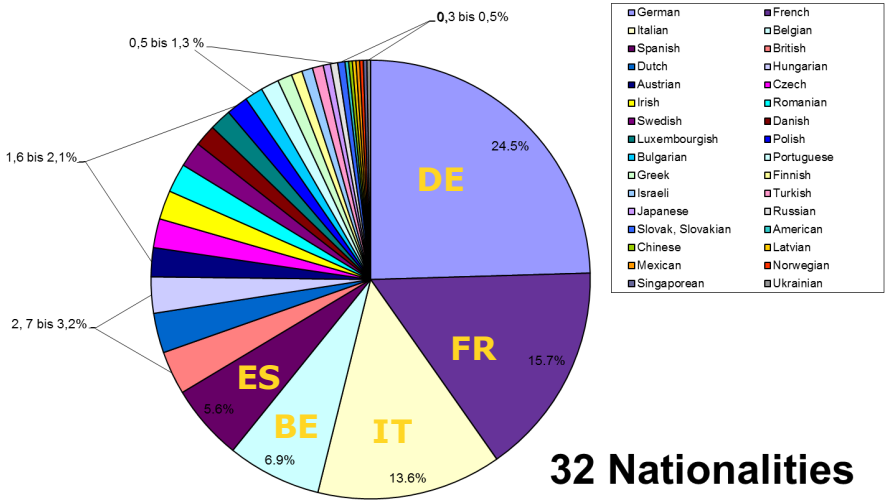
The mission of JRC-ITU is to provide the scientific foundation for the protection of the European citizen against risks associated with the handling and storage of highly radioactive material.

Institutional budget (~ 45 M€)
- JRC EURATOM programme (85%)
- Competitive activities (15%)

Staff
KA: ca. 300 plus ca. 150 external
Ispra: ca. 70

European School Karlsruhe

~ 1000 pupils



32 Nationalities

JRC-ITU Organigramm

European Commission

JRC-ITU Director
Maria Betti

Resource Management
Jacqueline Ribeiro

Site Management and Radiation Protection
Ralph Maier

Safety of Irradiated Nuclear Materials
Vincenzo Rondinella

Materials Research
Rudy Konings

Nuclear Fuel Safety
Joseph Somers

Nuclear Chemistry
Jean-Paul Glatz

Actinide Research
Robert Caciuffo

Nuclear Safeguards & Forensics
Klaus Lützenkirchen

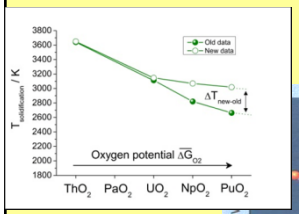
Nuclear Security (Ispra)
Willem Janssens

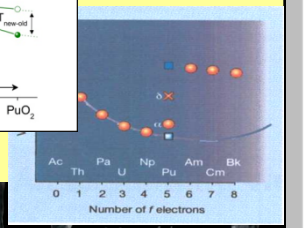
ITU's core competences

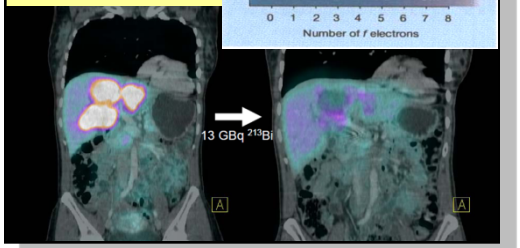
European Commission

NUCLEAR SAFETY and NUCLEAR SECURITY

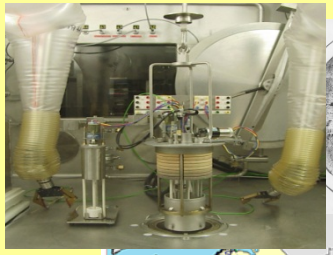
Scientific Excellence: Fundamental properties & applications

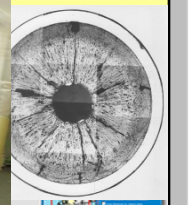


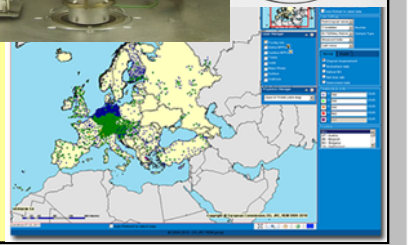




Safety of nuclear fuel cycle / waste management & decommissioning / environment





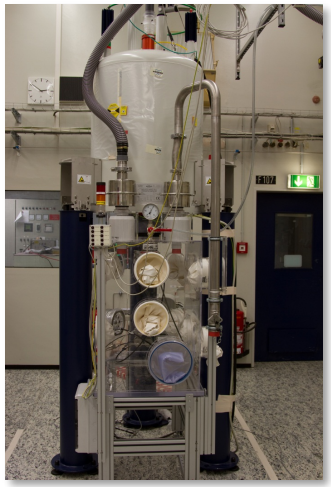


Nuclear safeguards, non-Proliferation, security & forensics

Training & Education

Joint Research Centre

Unique infrastructure and equipment



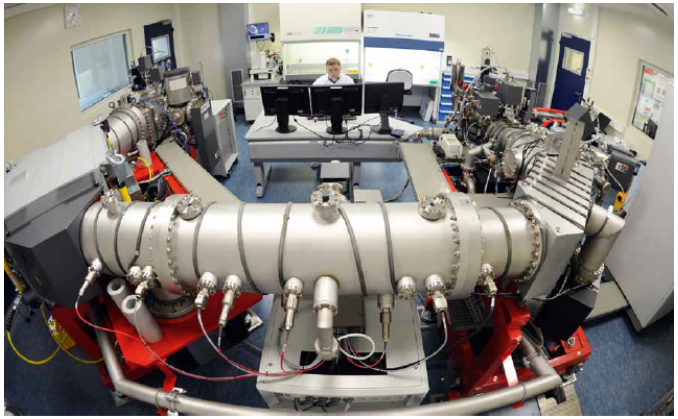
Solid State NMR

Hot Cells (24)

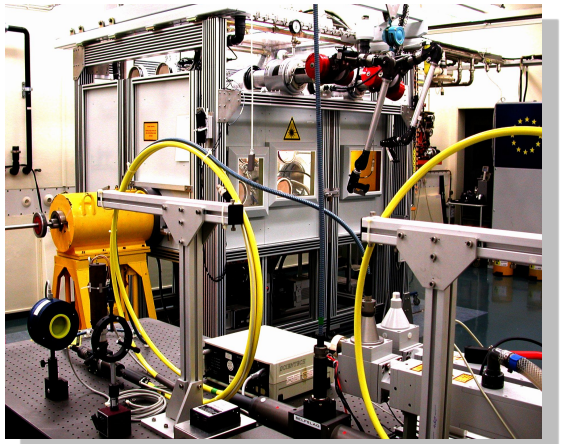
Transmission Electron Microscopy

Minor Actinide Laboratory

Surface Science



Large Geometry Secondary Ion Mass Spectrometry (SIMS)

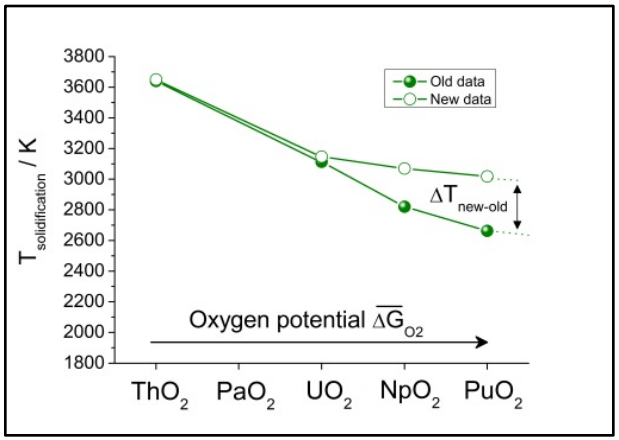


Thermophysics & Thermodynamics

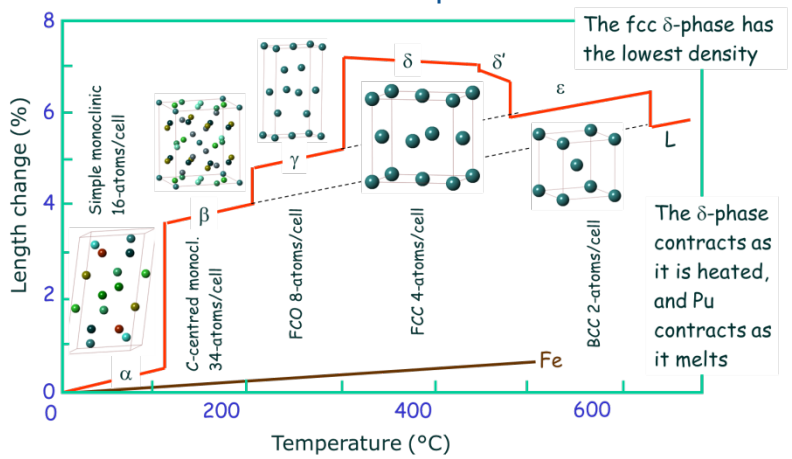
Scientific Excellence at JRC

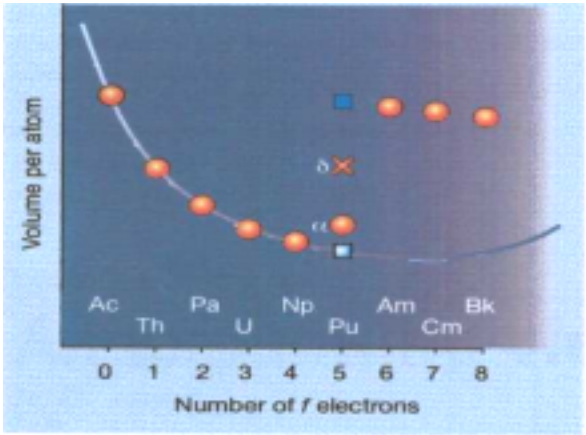
Fundamental Properties of Actinides & Nuclear Materials

- Physical properties under extreme conditions of temperature, pressure and magnetic field.
- Physical-chemistry of surfaces and interfaces of model materials
- Co-ordination chemistry
- High-temperature thermodynamic properties
- Radiation effects in condensed matter



Allotropic phases of Pu and anomalous thermal expansion

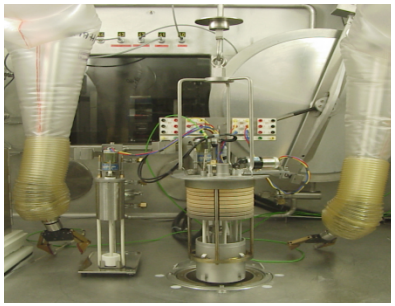




TRAINING & EDUCATION European Nuclear Safety & Security School
Promotion /Dissemination of EU's highest Safety/Security standards

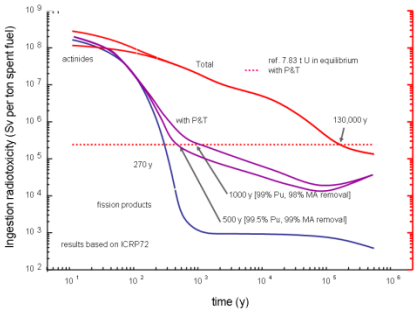
Nuclear Safety

Safety of nuclear fuels



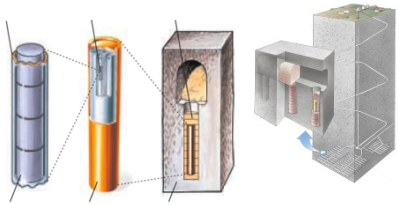
- Advanced/conventional fuels
- In-pile behaviour
- Normal, transient and accidental conditions
- Characterization of irradiated fuel from real and simulated accidents
- Code and Modelling (Transuranus)

Safety of nuclear fuel cycle



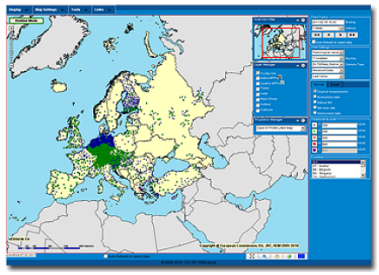
- Safety assessment of closing the nuclear fuel cycle
- Advanced aqueous partitioning
- Pyro-reprocessing technologies
- Head-end conversion processes

Nuclear Waste Management & decommissioning



- Safe/responsible disposal: assessment and modelling of key alteration processes / Implementation of EU directive
- Corrosion studies on irradiated fuels
- Conditioning matrices for minor actinides
- Long-term behaviour of spent fuels under storage conditions: Increased focus on interim storage / cladding issues / MOX fuels

Radioactivity in the environment



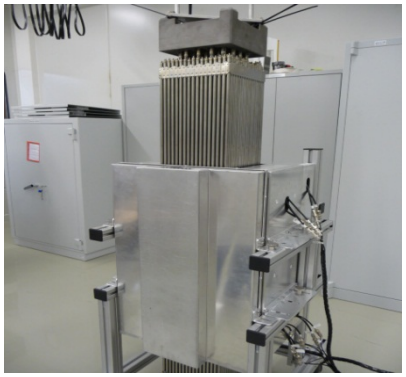
- Traces analysis
- Procedures for data collection, evaluation and harmonisation
- Dispersion model (routine and emergency conditions)
- Radioactivity environmental monitoring:
  - EURDEP (European Radiological Data Exchange Platform)
  - ECURIE

TRAINING & EDUCATION European Nuclear Safety and Security School Promotion /Dissemination of EU's highest Safety/Security standards

Nuclear Safeguards, & Security

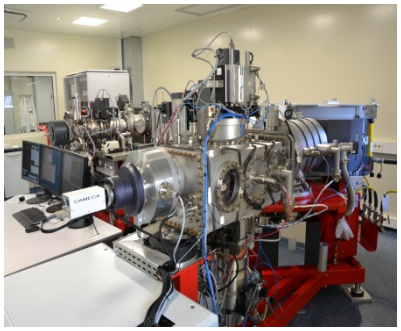
Non-Proliferation (ONLY Direct Actions)

Effective and Efficient Safeguards



- Nuclear material measurements
- Reference materials
- Containment & Surveillance
- Process monitoring
- On-site laboratories

Verification Absence of Undeclared Activities

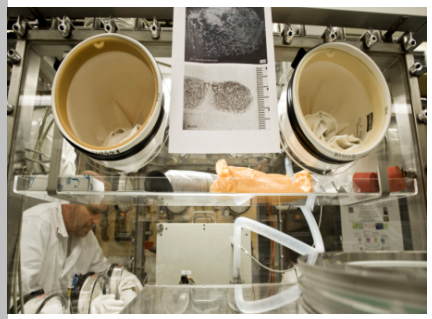


- Trace & particle analysis
- In-field tools for investigative inspector
- Reference materials

Nuclear Non Proliferation

- Export control
- Trade analysis
- Non-proliferation studies

Combating Illicit Trafficking



- Equipment development
- Testing & validation
- Nuclear forensics
- Nuclear preparedness
- National response plan
- CBRN, IfS, …

TRAINING & EDUCATION European Nuclear Security Training Centre Promotion /Dissemination of EU's highest Safety/Security standards

Joint Research Centre

Training & Education @ JRC

European Commission

- Training and education of next generation of scientists and experts (Grant Holders schemes)
- User access programs and Network of Excellence (MS projects)
- Karlsruhe Nuclide Chart (since 2006)
- Conferences/Workshops/Summer Schools
- European Nuclear Security Training Centre (EUSECTRA)
- Training for national and international inspectors (e.g. IAEA)

GENTLE

EURACT-nmr
Trans-national Access to Unique European Actinide and Radiological NMR Facilities

EUSECTRA
European Nuclear Security Training Centre

TALISMAN

Joint Research Centre

GENTLE

Graduate and Executive Nuclear Training and Lifelong Education

GRADUATE AND EXECUTIVE NUCLEAR TRAINING AND LIFELONG EDUCATION

www.gentleproject.eu

EURATOM

Objectives

Create a sustainable lifelong E&T programme in the field of nuclear fission technology in Europe that:

- Supports European stakeholders from industry, research and technical support organisations,
- contributes to their continuous professional development,
- brings together the leading nuclear academic institutions.

To reach these objective three main pillars are implemented:

- Student Research Experiences (through Mobility Grants)
- Inter-semester Courses for (post) graduate students
- Professional education on nuclear energy

Students research experience

OPPORTUNITIES FOR STUDENT MOBILITY

- GENTLE provides **grants** to BSc, MSc and PhD students to gain experiences at the research facilities of a GENTLE partner and are not in the same domicile as the University at which the students are registered.
- The internships can be from 1 up to 24 months
- Open posts, in different scientific fields (nuclear fuel, nuclear data, neutronics, thermalhydraulics, etc.) are published on the GENTLE web page. Moreover, students can ***propose*** own research projects and Internships too.

Inter-semester courses

- These are short courses (4-5 days) for graduate students on topics not generally part of the academic curriculum. They include on-site demonstrations, visits, and excursions to industrial facilities.

Name	Location/contact	Date
Nuclear Data	*JRC-IRMM, Belgium* *schillebeeckx@ec.europa.eu*	*June 2014*
Safeguards and Security	*SCK-CEN, Belgium* *mcoeck@sckcen.be*	*July 2014*
Reactor Techniques	*BME, Hungary* *legrady@reak.bme.hu*	*Feb 2015*
Thermal Hydraulic Phenomena	*LUT, Finland* *arto.ylonen@lut.fi*	*April 2015*
Nuclear Waste Management	*KIT, Germany* *volker.metz@kit.edu*	*July 2015*
Nuclear Decommissioning	UMAN, UK lennox@manchester.ac.uk	**Sep 2015**
Nuclear Fuels	JRC-ITU, Germany dario.manara@ec.europa.eu	**June 2016**

Professional Education Program

- The Professional Education Programme is for participants who want to enhance their knowledge in the nuclear energy field. The programme consists of modules.

  - Module 1 Understanding Nuclear Power
  - Module 2 Producing energy with nuclear reactors
  - Module 3 Nuclear fuel from Ore to Waste
  - Module 4 Conditions for societal justification of nuclear energy
  - Module 5 Management systems

Pilot scheme under preparation

GENTLE PARTNER

www.gentleproject.eu

GRADUATE AND EXECUTIVE NUCLEAR TRAINING AND LIFELONG EDUCATION

www.gentleproject.eu

European Commission

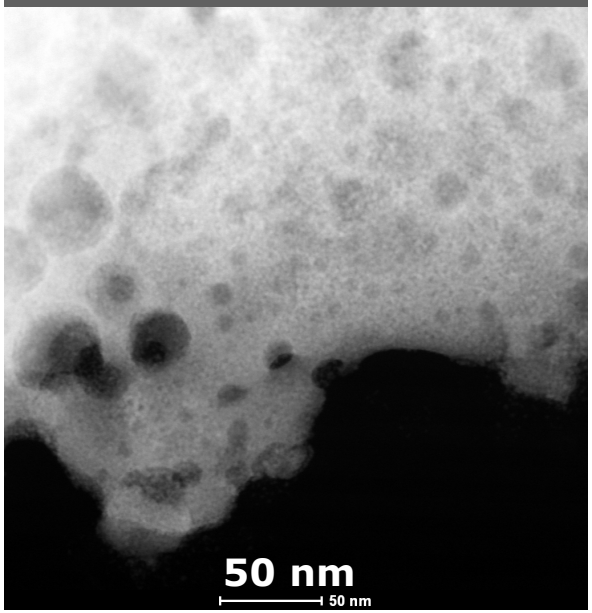
Thank you for your attention

Joint Research Centre

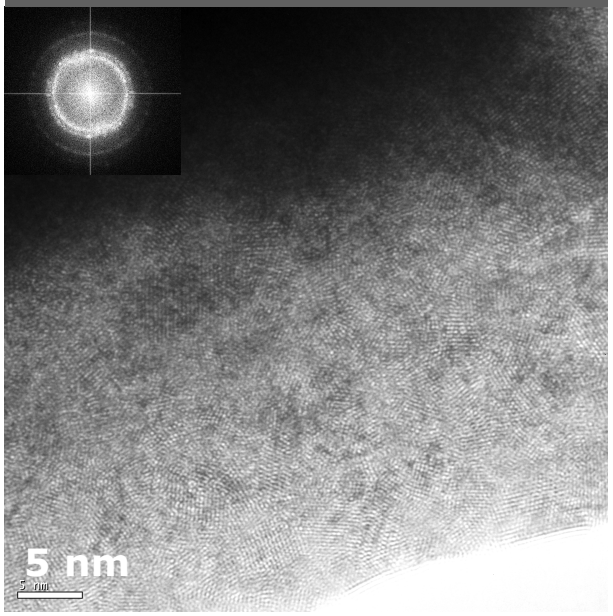
alpha-damage AmO_2 - 36 dpa

European Commission

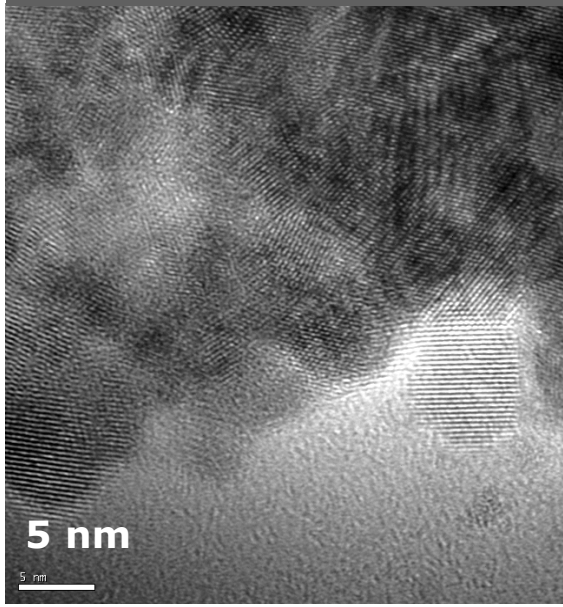
He – Gasblasen

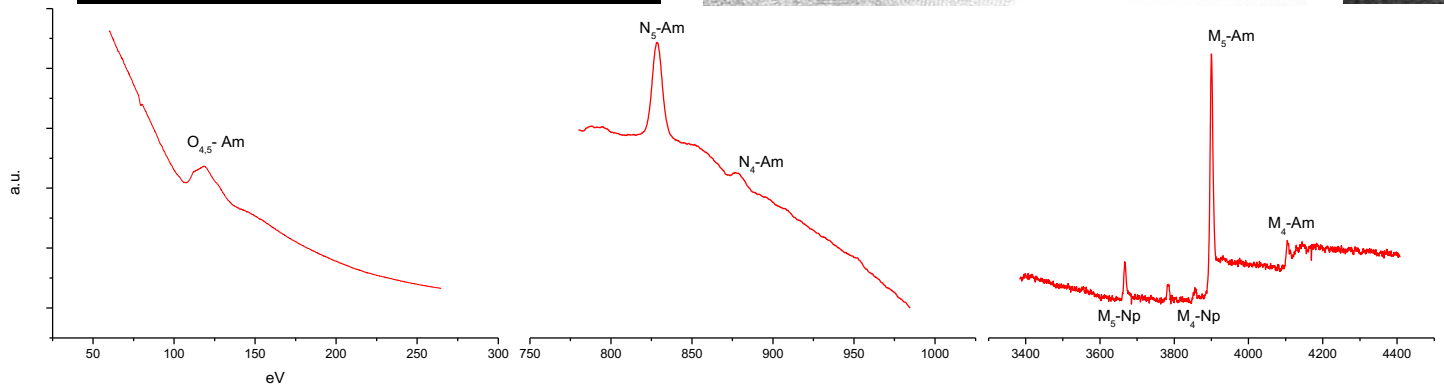


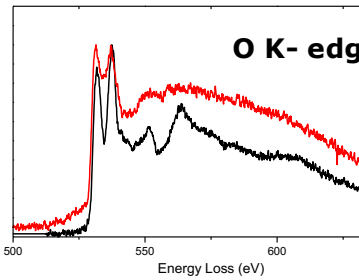
Entstehung von Strahlenschäden



Bildung neuer Korngrenzen







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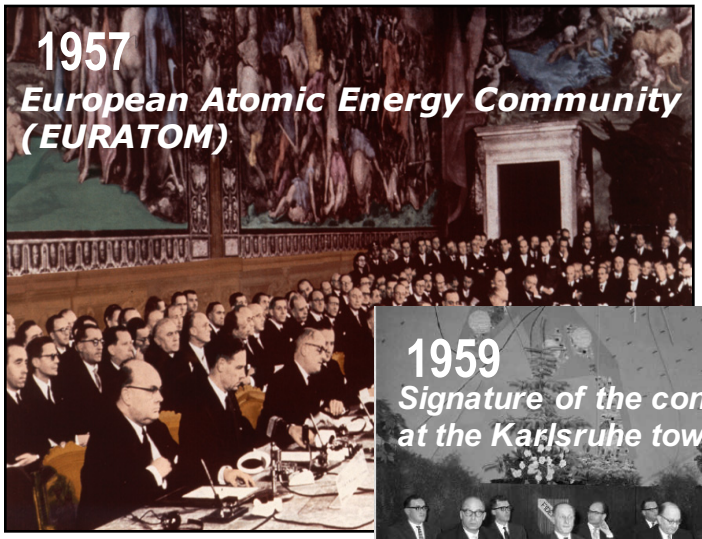
European Commission



Short history of JRC-ITU

1. April 1963: Official launch ceremony

1964: first laboratories are operational

$La_2(Zr_{2-x}U_x)O_{7+\delta}$ pyrochlores