UKAEA's NNUF Facilities

Materials Research Facility

Gamma detectors (ADRIANA)

Martin O'Brien

ADRIANA

(Advanced Digital Radiometric Instrumentation for Applied Nuclear Activities)

- **State of the art equipment for measurement of radioactive material**
- **Lancaster, Liverpool and Culham equipment funded by NNUF/EPSRC**
- **Liverpool and Culham: advanced HPGe systems**
- **Lancaster: Neutron detection systems**

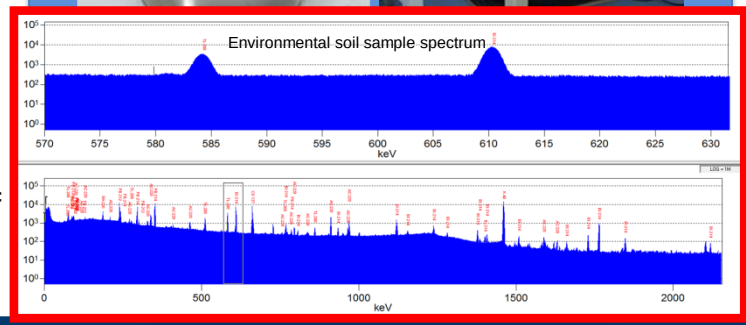
Examples: Activities in 2016

- Student training and projects
  - Environmental soil samples from Dounreay and neutron source irradiation facility characterisation (Lancaster)
  - Generalized gamma spectrometry simulator for improved isotope identification (Birmingham/AWE)
  - HPGe detector characterisation, validation and testing using automated computational methods (Birmingham)
- Equipment lent to ISIS to measure gamma environment (STFC)
- UKAEA uses - for JET and for support & testing instrumentation for MRF hot cell sample receipt & assay

Under discussion:

- Loan portable monitor to measure hold up in Sellafield glove boxes
- Oxford School of Geography and Environment measurements of U, Th and K in soils

Culham's ADRIANA systems



Materials Research Facility

– opened by Jo Johnson May 2016

To provide hot cells to process radioactive material and shielded instruments for analysis – intermediate between university and NNL/Sellafield capabilities

- Now: analysis of slightly active and inactive material – already used by Birmingham, Loughborough, Oxford, Queen Mary, Strathclyde, industry
- Hot cells and shielded instruments available from early 2017
- Continually expanding capability: £5M from Sir Henry Royce Institute (£1M this FY) plus further investments expected from NNUF.

MRF – Equipment Timeline

Now (low activity samples)

Focused Ion Beam
Nano-indenter
SEM (with EDX, EBSD, TKD)
AFM
XRF monitor

Thermal Desorption Spectroscopy

Glove Boxes

10 kN tensile testing

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Early 2017

hot cells equipment

Slow cut saw, Shear cutter
Grinding and polishing
Hot Isostatic Press & cold resin sample mounting
In-cell microscopes for sample evaluation
Balances (load cells)

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Late spring 2017 onwards

FIB, SEM, etc. in shielded cells

Mechanical and Thermo-physical testing in shielded cells

- micro-hardness; static, fatigue, creep; fracture toughness
- Dilatometry. Thermal conductivity / diffusivity. DSC / TGA. Gas pycnometer

Improved sample preparation

- EDM, Electro-polishing, TEM disk preparation

Tritiation of samples and TDS, permeation and other T measurements

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> 2 years

Further testing equipment

2 additional hot-cells, flexible inner containments

- Fitting in hot-cell
- Fitting in instrument cell
- To be used as glove box

Beryllium glovebox line

As well as providing these facilities we are keen to collaborate on related research (experiments and modelling)

- Radiation detection – neutrons and gammas
- Tritium R&D – permeation, implantation/adsorption/out-gassing, storage options, etc.
- Radiation Damage (steels, tungsten)
  - Techniques – microscopy, micromechanics
  - Ion irradiation cf. neutrons
  - Length-scale effects
  - Gases in irradiated materials
  - etc.

For more details

MRF

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