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Title:	US/UK Second Level Panel Discussions on the health and value of: Aging and Lifetime Prediction (U)
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US/UK Second Level

Panel discussions on the health and value of:

Ageing and Lifetime Prediction

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Los Alamos National Laboratory

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National Nuclear Security Administration
Forrestal Building, Washington DC

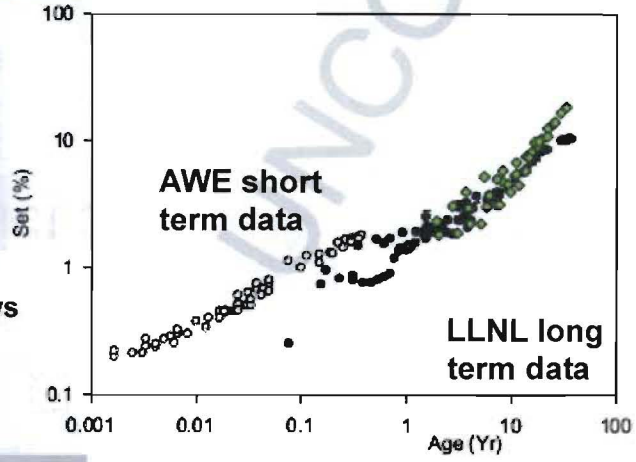
Ageing and Lifetime Prediction

Many healthy physics, engineering, and materials exchanges are being accomplished in ageing and lifetime prediction that directly supports US and UK Stockpile Management Programs

Lifetime Assessment Studies of Silicone Foams under Compression

• Joint AWE/LANL/LLNL study of compression set in stress cushions completed. Provides phenomenological prediction out to 50 years.

X-ray CT image shows porous structure



Compression set (%) as a function of time (years)

Polymer Volatile Out-gassing Studies

• New exchange on the out-gassing of Ethylene Vinyl Acetate (EVA) using isotopic ^{13}C labeling studies to interrogate mechanistic processes. Infra-red (IR) gas cell analytical capabilities developed by AWE will be used to monitor polymer out-gassing profiles

Infra-red gas cell capability (AWE)

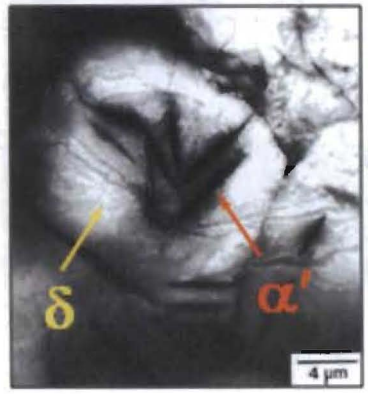
Ageing and Lifetime Prediction

Pu Strength ageing Experiments and Constitutive Modeling

- In recently compared modeling strategies for ageing effects on Pu yield strength at high strain rates, a US/UK consensus was reached on the general principle that the ageing effect is additive and not multiplicative

- The fundamental mechanisms for age-strengthening in Pu remains unknown

Phase Stability and Phase Relationships in Pu Alloys

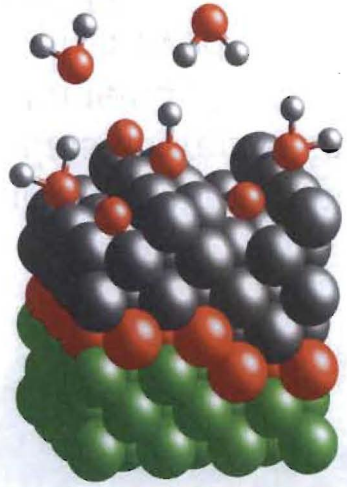


Alpha prime plates inside delta phase Pu

Pu Surface and Interface Reactions

- US/UK secondment resulted in developing a metal-metal oxide model for radiation damaged studies consistent with a Modified Embedded Atom Method (MEAM) potential

- Joint US/UK collaboration to study the role of impurities in hydride initiation



H_2O

PuO_2

Pu_2O_3

Pu metal

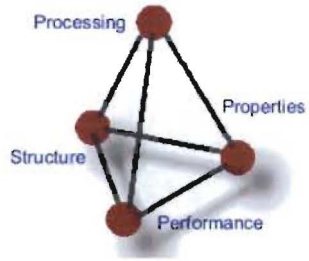
Ageing and Lifetime Prediction

Detonator Ageing (wide range of activities)

- Long-term ageing study with field trials at Pantex incorporating materials from LANL, LLNL, SNL and AWE
- Characterization of PETN growth to detonation process
- Detonator performance modeling
- Performance fault tree analysis

Benefits

Unified approach to lifetime prediction that Includes: materials characterization and the development of ageing models through improved understanding of the relationship between materials properties, ageing properties and detonator performance



Life Assessment of CSAs

B61 focus exchange on life assessment philosophies of CSAs that included:

- CSA reuse studies
- Surveillance
- Materials life assessment methodologies
- US/UK stockpile health & life assessment methodology

The B61 LEP baseline for the Canned Subassembly (CSA) is to reuse existing units. Work has started to build the body of evidence to meet the life requirements for the system (B61 28-Unit Study). Exchange provided the B61 team with AWE's methodologies on Life Assessment.

Summary

Value of Collaborations:

- Unified approaches to lifetime prediction and comparison of approaches to life assessment
- Pooling of results, experiences, and resources to increase efficiency and effectiveness
- Accessing and exercising unique expertise and facilities
- Peer-review of shared work through publications in quality scientific journals
- Validation of models and theory
- Training and testing of our weapons scientists
- Developing and testing new characterization methods and diagnostics

US and UK Milestones supported – Life Extension Programs and Annual Assessments

Future:

- The Quad Lab review of Ageing and Prediction exchanges are being adequately addressed through current JOWOG and EC collaborations and do not require at this time a focused workshop to align US and UK activities
- Technical results of exchanges will be monitored against Stockpile Management Programs