
Pulsed Radiation Damage by IFE Neutrons-

What Can We Expect?

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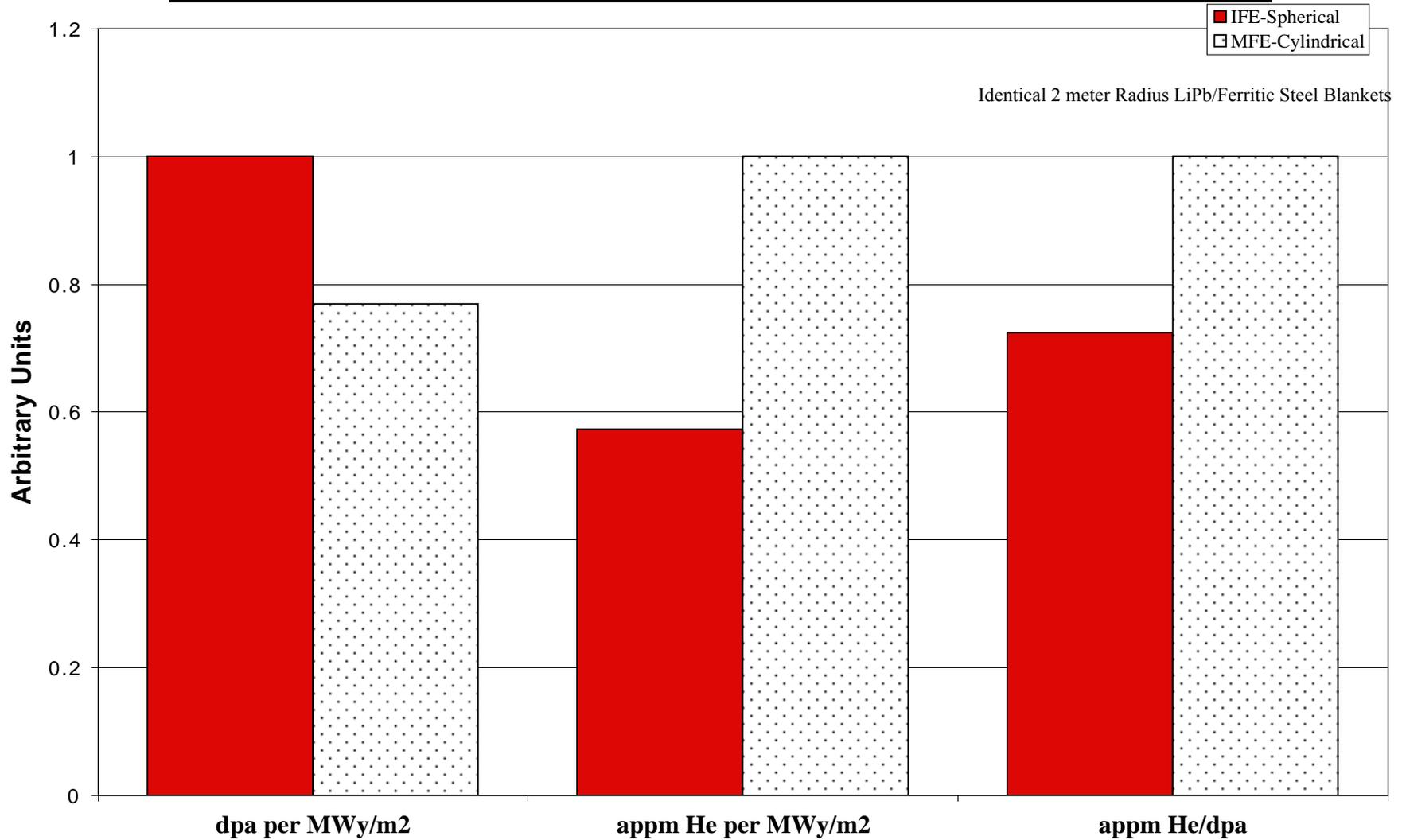
University of
Wisconsin

Why the Damage Produced by 1 MW-y/m² of Neutrons is Not the Same in MFE and IFE Systems

- Geometrical Effects
- Spectral Effects
- Temporal Effects
- Rate Effects

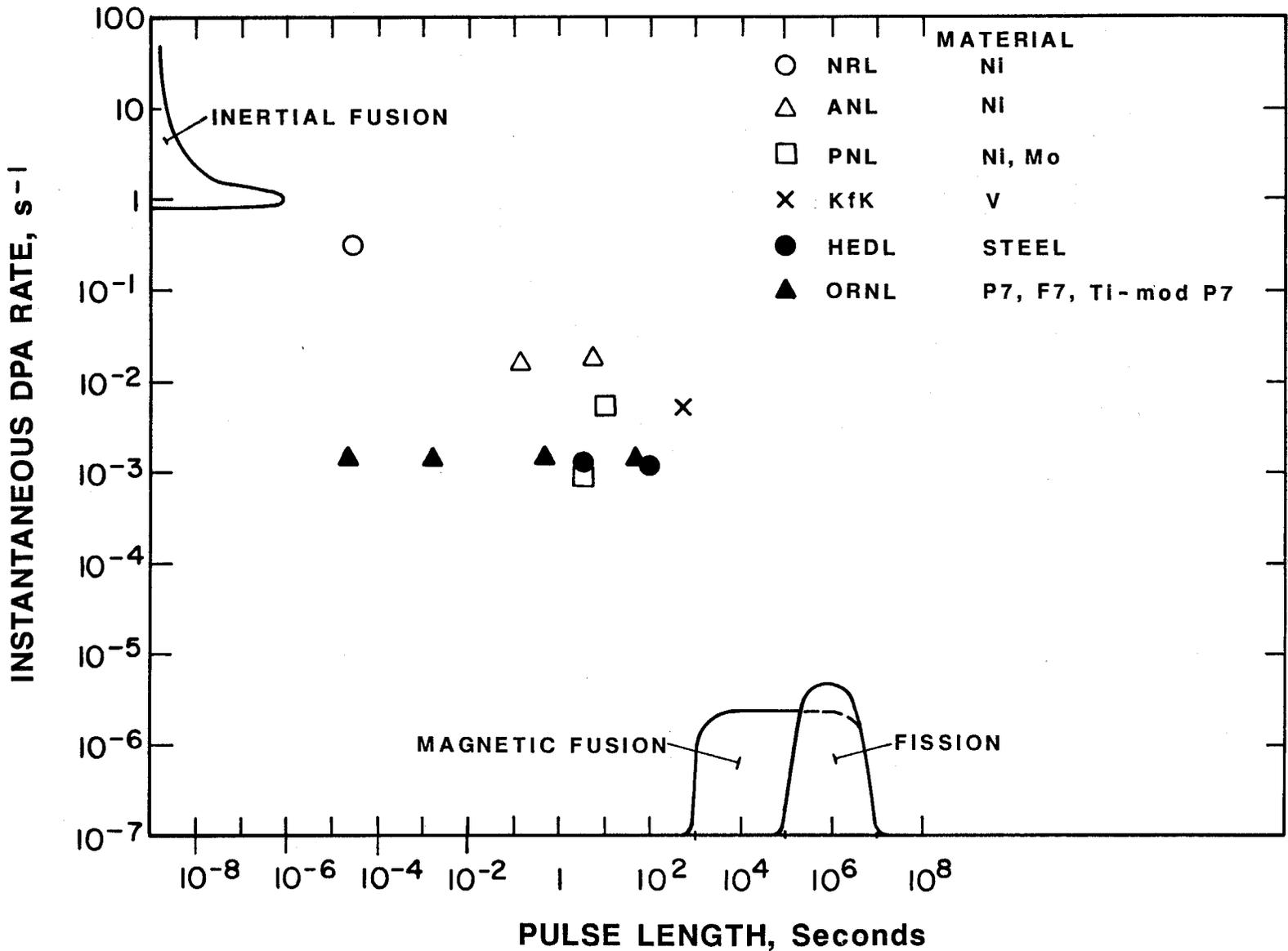


There is a Significant Difference Between First Wall Radiation Damage Parameters in IFE and MFE Chambers Because of Spectral and Geometric Effects

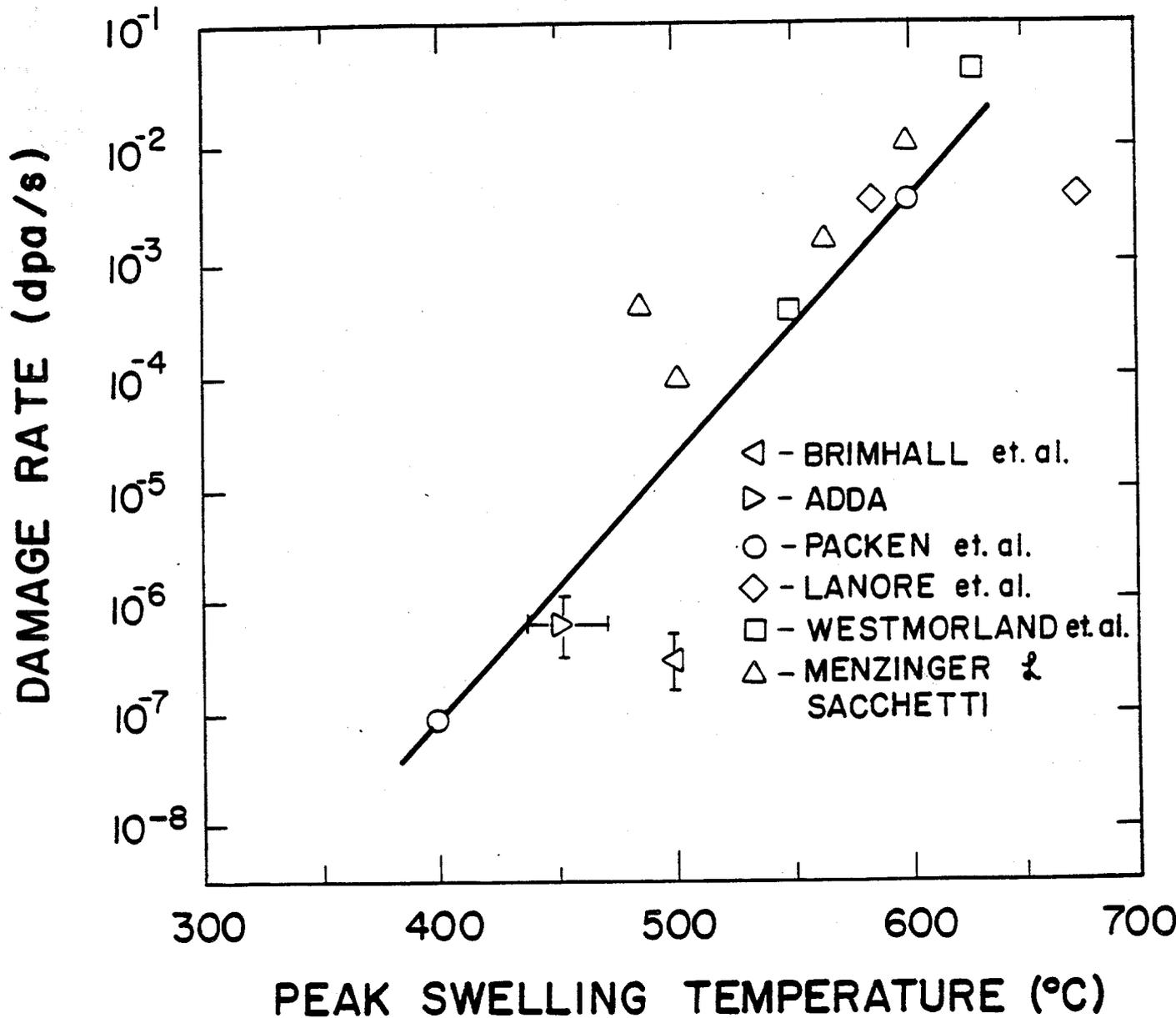


SUMMARY OF EXPERIMENTAL CONDITIONS STUDIED

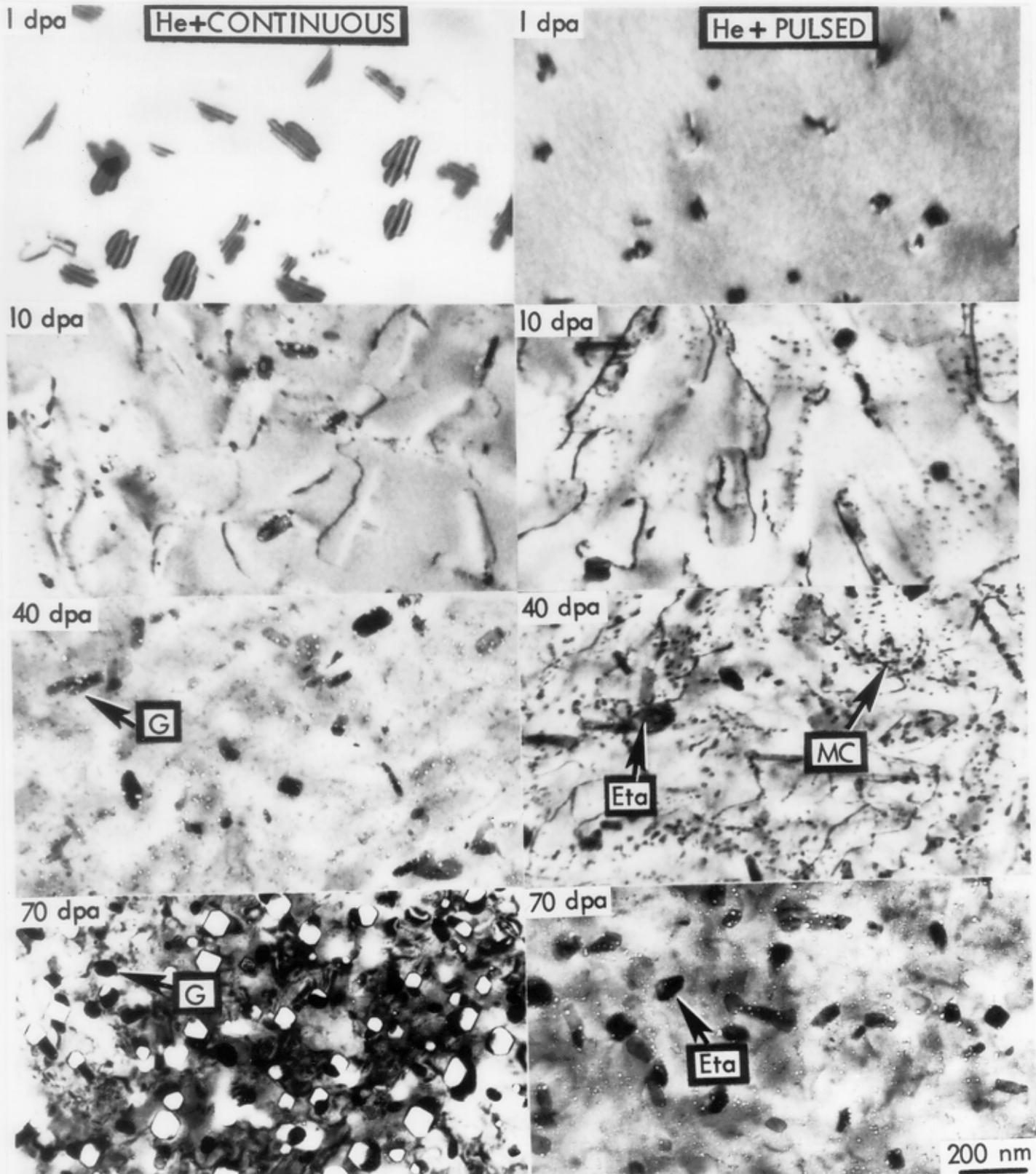
FOR PULSED IRRADIATION STUDIES



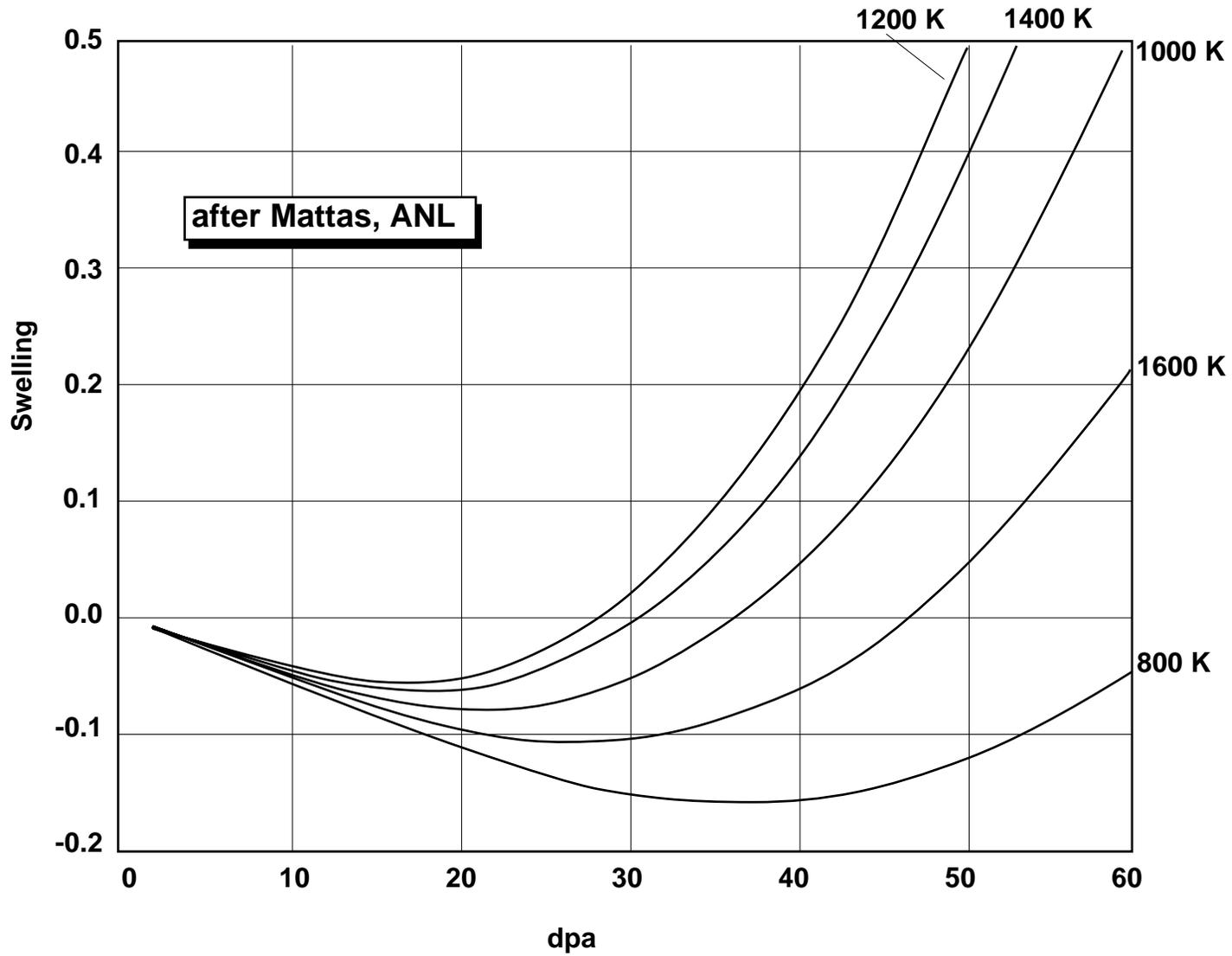
EFFECT OF STEADY STATE DAMAGE RATE ON PEAK SWELLING IN NICKEL

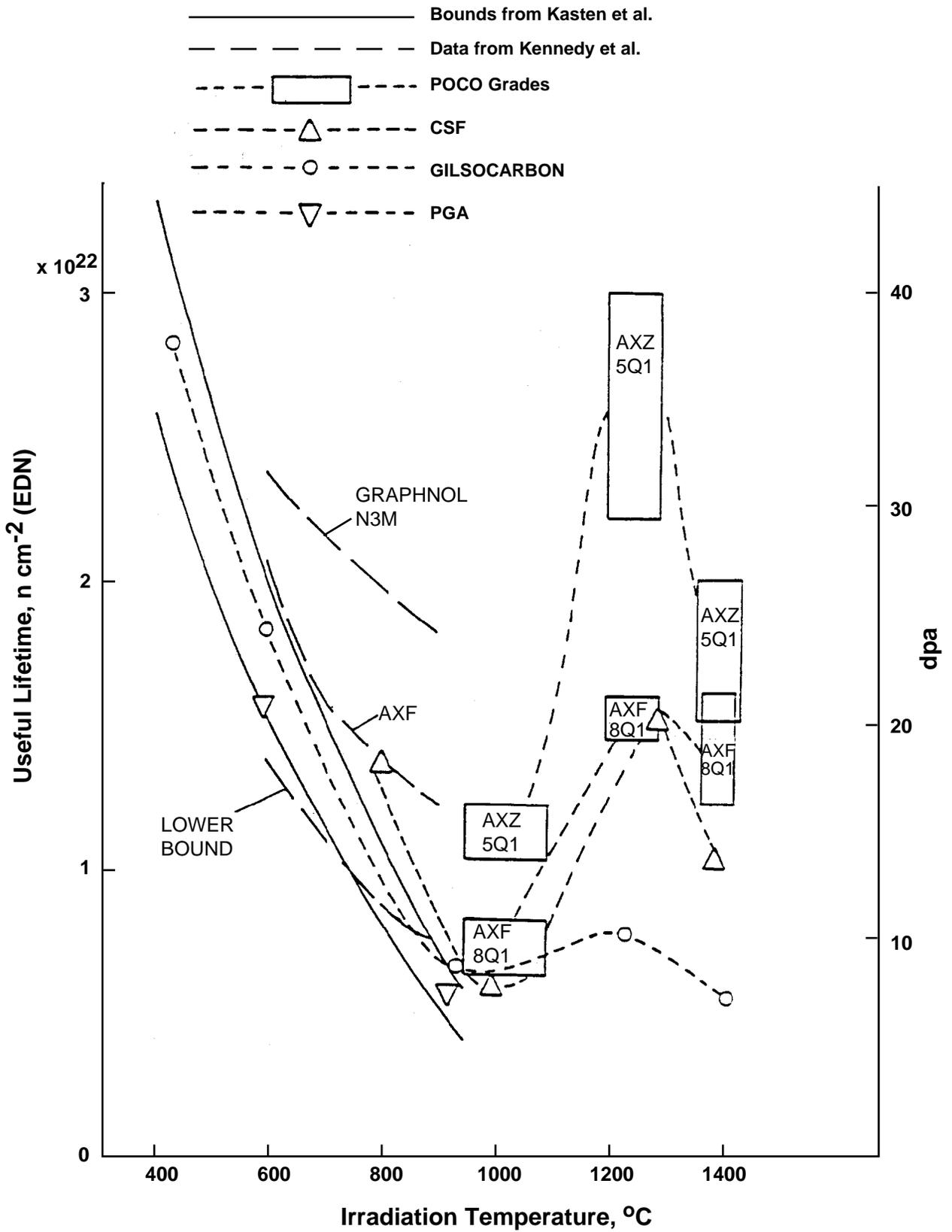


PULSED ION IRRADIATION WITH SIMULTANEOUS HELIUM INJECTION LEADS TO LARGE CHANGES IN SWELLING, PHASE TRANSFORMATIONS AND DISLOCATION LOOPS



The Useful Lifetime of Carbon Material is Determined by the Dpa Level at Which the Net Dimensional Change is Zero





Conclusions

- There is currently no irradiation test facility that can adequately simulate the pulsed radiation damage in IFE first walls.
- Past experimental data indicates a significant effect of pulsing (at lower damage rates) on the swelling and microstructure of metals
- There are conflicting results from theoretical studies of IFE pulsing on the mechanical properties of metals.
- There is no experimental or theoretical information on IFE pulsed effects for C-C or SiC composites.



Conclusions (2)

- Monitoring of Molecular Dynamic simulation programs for metals will be carried out over the phase one period.
- Development of a potential test program plan will attempted in hopes that new ICF neutron test facility can be built.

