SCHEDULE AND STATUS OF IRRADIATION EXPERIMENTS – M. L. Grossbeck and A. F. Rowcliffe (Oak Ridge National Laboratory)

OBJECTIVE

To provide an updated summary of the status of irradiation experiments for the neutron-interactive materials program.

SUMMARY

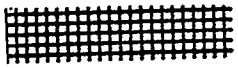
The current status of reactor irradiation experiments is presented in tables summarizing the experimental objectives, conditions, and schedule.

PROGRESS AND STATUS

A similar set of tables and graphs was included in the ADIP Progress Reports through the Report for the Period Ending March 31, 1986. On November 14, 1986, the HFIR was shut down until July 17, 1990. During this time, re-evaluation of program priorities resulted in the cancellation of HFIR-CTR-51 and HFIR-CTR-57 through 59. Other HFIR irradiation experiments in progress were terminated at the neutron exposure levels achieved. These changes are reflected in the schedule, which goes back as far as 1984 in order to link with the previous report of 1986.

For convenience, the status of each experiment is shown in the last column with the following legend:

Irradiation complete 

Irradiation in progress 

Irradiation planned 

Currently, the program has six irradiation experiments in reactor; a further 18 experiments are in the planning or design stages.

FUTURE WORK

The schedule will be updated and modified with subsequent reports. The report will be shortened by the elimination of earlier experiments, thus emphasizing the current and future experiments. The extended version was used for this report only in order to provide a complete status report when coupled with the 1986 report.

Reactor Irradiation Experiments
Summary and Schedule

Experiment	Lead Lab	Collaborators	Responsible Person	Major Objectives	Materials	Temperature °C	Dose (dpa) or fluence	Irrad. Start	Irrad. Finish	Status
Fast Flux Test Facility, Richland, WA										
MOTA 1A	HEDL		A.M. Ermi	Fast neutron irradiation effects on microstructure and mechanical properties	Ceramics, graphite, Cu, Be	500	28	Dec-82	Oct-83	
MOTA 1B	HEDL		A.M. Ermi	Fast neutron effects on tensile prop., irradiation creep, fatigue, microstructure, impact properties, and thermal conductivity.	Austenitic and ferritic steels, V, low act. materials, ceramics, Cu, Be, C-C composites	370-600	15	Dec-83	Apr-84	
MOTA 1C	HEDL		A.M. Ermi	Similar to MOTA 1B	Similar to MOTA 1B with the addition of Ni alloys	370-600	36	May-84	Jun-85	
MOTA 1D	HEDL		A.M. Ermi	Similar to MOTA 1B	Similar to MOTA 1B with the addition of Al alloys and Ni59-doped steels	370-600	26	Jul-85	Jun-86	
MOTA 1E	HEDL		A.M. Ermi	Tensile prop., Charpy, fracture toughness, irrad. creep, TEM, fatigue, and thermal conductivity	Austenitic and ferritic steels, V, Cu, C, Al alloys, low act. alloys, Ni59-doped steels.	370-600	38	Jul-86	Sep-87	
MOTA 1F	HEDL		A.M. Ermi	Similar to MOTA 1E	Similar to MOTA 1E but no Al alloys	370-600	37	Nov-87	Dec-88	
MOTA 1G	HEDL		A.M. Ermi	Tensile and Charpy impact prop., irrad. creep, TEM, crack growth, and fatigue	Austenitic and ferritic steels, V, Be, Cu, Ni59-doped steels, low act. alloys	370-600	44	Jan-90	Mar-91	
MOTA 2A	PNL	MONBUSHO	M.L. Hamilton	Tensile and Charpy impact prop., irrad. creep, TEM, thermal conductivity	Austenitic and ferritic steels, V, Be, Cu, C, Mo, W, W-Re, Cu/C, low act. materials, ceramics	370-800	44	Jan-90	Mar-91	

Reactor Irradiation Experiments
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Experiment	Lead Lab	Collaborators	Responsible Person	Major Objectives	Materials	Temperature °C	Dose (dpa) or fluence	Irrad. Start	Irrad. Finish	Status
MOTA 2B	PNL	MONBUSHO, ORNL, ANL	M.L. Hamilton	Tensile and Charpy impact prop., fracture toughness, Irrad. creep, TEM, crack growth, fatigue, and thermal conductivity	Austenitic and ferritic steels, V, Be, Cu, C, Mo, C-C composites, SiC, SiC-SiC, C-Cu, C-TZM	370-800	26	May-91	Mar-92	
EBR-II, Reactor, ANL, Idaho Falls, ID										
COBRA 1A1	PNL	ORNL, ANL, MONBUSHO	M.L. Hamilton	Tensile and fatigue prop., Charpy impact, fracture toughness, TEM	Austenitic and ferritic steels, Fe-alloys, V, Be, low act. materials, Cu alloys, Ti-Al, SiC, C-C comp.	370, 500, 600	9	Nov-92	Apr-93	
COBRA 1A2	PNL	ORNL, ANL, MONBUSHO	M.L. Hamilton	Tensile and fatigue prop., Charpy impact, fracture toughness, TEM	Aust. and ferritic steels, Fe-alloys, V, Be, low act. materials, Cu alloys, Ti-Al, SiC, C-C comp.	370, 400, 800	33	Nov-92	Sep-94	
X530	ANL		H. Tsai, H.M. Chung	He-effects, swelling, Charpy impact, fracture toughness, tensile prop.	V alloys	370	5	Aug-94	Sep-94	
High Flux Isotope Reactor, ORNL, Oak Ridge, TN										
HFIR-CTR-49	ORNL		R.L. Klueh	Tensile Prop., TEM	Ferritic steels	300-500	52	Jul-84	Jan-86	
HFIR-CTR-50	ORNL		R.L. Klueh	Tensile Propl, TEM	Ferritic steels	400, 600	72	Mar-84	Nov-86	
HFIR-CTR-51, 52	ORNL			Cancelled						
HFIR-CTR-53, 54	ORNL		R.L. Klueh	Charpy Impact	Ferritic steels	200-300	2	Oct-86	Nov-86	
HFIR-CTR-55, 56	ORNL		R.L. Klueh	Tensile Prop., TEM	Ferritic steels, low act. ferritics	400,600	53	Nov-84	Nov-86	
HFIR-JP-TTT	ORNL	JAERI	I.I. Siman Tov	Nuclear Heating Measurement				Jul-86	Nov-86	
HFIR-CTR-57, 58, 59	ORNL			Cancelled						

Reactor Irradiation Experiments
Summary and Schedule

Experiment	Lead Lab	Collaborators	Responsible Person	Major Objectives	Materials	Temperature °C	Dose (dpa) or fluence	Irrad. Start	Irrad. Finish	Status
HFIR-CTR-60	ORNL		S.J. Zinkle	Flexure bars, TEM, indentation disks	Isotopically tailored ceramics	100-600	2.4E+26 n/m2	Dec-94	Nov-95	
HFIR-CTR-61	ORNL		S.J. Zinkle	Similar to HFIR-CTR-60			7.20E+26	Dec-94	Aug-98	
HFIR-CTR-62	ORNL		R.L. Klueh	Charpy impact prop. and He effects	Reduced act. and conventional ferritic steels	300, 400	10	Feb-95	Aug-95	
HFIR-CTR-63	ORNL		R.L. Klueh	Charpy impact and tensile prop., TEM, He effects	Reduced act. and conventional ferritic steels	300, 400	10	Feb-95	Aug-95	
HFIR-JP-9	ORNL	JAERI	P.J. Maziasz/ J.E. Pawel	He effects by isotopic tailoring, tensile prop., TEM	Austenitic and ferritic steels	300-600	57	Jul-90	Apr-94	
HFIR-JP-10	ORNL	JAERI	P.J. Maziasz/ J.E. Pawel	He effects by isotopic tailoring, tensile prop., TEM	Austenitic and ferritic steels	300-600	18	Jul-90	Sep-91	
HFIR-JP-11	ORNL	JAERI	P.J. Maziasz/ J.E. Pawel	Similar to HFIR-JP-10			18	Jul-90	Sep-91	
HFIR-JP-12	ORNL	JAERI	P.J. Maziasz/ J.E. Pawel	Similar to HFIR-JP-9			57	Jul-90	Apr-94	
HFIR-JP-13	ORNL	JAERI	P.J. Maziasz/ J.E. Pawel	Similar to HFIR-JP-10			18	Jul-90	Sep-91	
HFIR-JP-14	ORNL	JAERI	P.J. Maziasz/ J.E. Pawel	He effects by isotopic tailoring, tensile prop., TEM	Austenitic and ferritic steels	300-600	34	Jul-90	Sep-92	
HFIR-JP-15	ORNL	JAERI	P.J. Maziasz/ J.E. Pawel	Similar to HFIR-JP-9			57	Jul-90	Apr-94	
HFIR-JP-16	ORNL	JAERI	P.J. Maziasz/ J.E. Pawel	Similar to HFIR-JP-10			18	Jul-90	Sep-91	
HFIR-JP-17	ORNL	JAERI	M.L. Grossbeck/ J.E. Pawel	Fracture toughness, tensile prop. TEM	Austenitic and ferritic steels	250-300	3	Dec-91	Feb-92	
HFIR-JP-18	ORNL	JAERI	M.L. Grossbeck/ J.E. Pawel	Fracture toughness, tensile prop. TEM	Austenitic and ferritic steels	60-125	3	Aug-91	Oct-91	
HFIR-JP-19	ORNL	JAERI	M.L. Grossbeck/ J.E. Pawel	Similar to HFIR-JP-18		60-125	3	Aug-91	Oct-91	
HFIR-JP-20	ORNL	JAERI	J.E. Pawel	Tensile Prop., TEM, He effects by isotopic tailoring	Austenitic and ferritic steels	300-600	8	Dec-93	Jun-94	
HFIR-JP-21	ORNL	JAERI	J.E. Pawel	Similar to HFIR-JP-20			18	Dec-93	Apr-95	

Reactor Irradiation Experiments
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Experiment	Lead Lab	Collaborators	Responsible Person	Major Objectives	Materials	Temperature °C	Dose (dpa) or fluence	Irrad. Start	Irrad. Finish	Status
HFIR-JP-22	ORNL	JAERI	J.E. Pawel	Similar to HFIR -JP-20			34	Dec-93	Dec-95	
HFIR-JP-23	PNL	MONBUSHO	D.S. Gelles	TEM	Austenitic and ferritic steels, Cu, Mo, V alloys, TiAl	300-600	8	Dec-93	Jun-94	
HFIR-MFE-60J	ORNL	JAERI	J.L. Scott/M.L. Grossbeck	Spectrally tailored for fusion He prod. Began in ORR as ORR-MFE-6J (6.9 dpa). TEM, Charpy, irrad. creep, tensile and crack growth prop.	Austenitic and ferritic steels, and Ni alloys	60	18 (total)	Jul-90	Nov-92	
HFIR-MFE-330J	ORNL	JAERI	J.L. Scott/M.L. Grossbeck	Similar to HFIR-MFE-60J. Began in ORR as ORR-MFE-7J (7.4 dpa)		330	18 (total)	Jul-90	Nov-92	
HFIR-MFE-200J	ORNL	JAERI	M.L. Grossbeck/J.E. Pawel	Similar to HFIR-MFE-60J. Began in ORR as ORR-MFE-6J (6.9 dpa)		200	18 (total)	Nov-92	Jan-95	
HFIR-MFE-400J	ORNL	JAERI	M.L. Grossbeck/J.E. Pawel	Similar to HFIR-MFE-60J. Began as ORR-MFE-7J (7.4 dpa)		400	18 (total)	Nov-92	Jan-95	
HFIR-TRIST-ER1	ORNL	MONBUSHO	S.J. Zinkle	In-situ electrical conductivity	Al2O3	450	3E+25 n/m2	Aug-95	Nov-95	
HFIR-TRIST-ER2	ORNL	JAERI	S.J. Zinkle	Electrical properties of insulating ceramics	MgAl2O4, AlN, Si3N4	300	1E+25 n/m2	May-96	Jun-96	
HFIR-MFE-RB-10J	ORNL	JAERI	J.E. Pawel	Tensile; fracture	316LN-1G, J316	200, 300	4	Jan-96	Sep-96	
HFIR-JP24	ORNL	JAERI	J.E. Pawel	Tensile, fatigue, fracture toughness	316LN-1G, J316	300	4	Apr-96	Jul-96	
HFIR-MFE-RB-11J	ORNL	JAERI/ MONBUSHO	R.L. Klueh	Tensile, fracture, TEM	Low activation ferritics	300	5	Mar-96	Feb-97	
HFIR-MFE-RB-12J	ORNL	JAERI/ MONBUSHO	R.L. Klueh	Tensile, fracture, TEM	Low activation ferritics	500	5	Nov-96	Dec-97	
HFIR-JP25	ORNL	JAERI	R.L. Klueh	Tensile, fracture, TEM	Low activation ferritics	300, 400, 500	20	Jun-97	Sep-98	
HFIR-JP26	ORNL	JAERI	R.L. Klueh	Tensile, fracture, TEM	Low activation ferritics	300, 500	5	May-96	Sep-96	

Reactor Irradiation Experiments
Summary and Schedule

Experiment	Lead Lab	Collaborators	Responsible Person	Major Objectives	Materials	Temperature °C	Dose (dpa) or fluence	Irrad. Start	Irrad. Finish	Status
HFIR-JP27	ORNL	JAERI	L.L. Snead	Fracture, TEM	Intermetallics, SiC	500-800	10	FY-97	FY-97	
HFIR-JP28	ORNL	JAERI	L.L. Snead	Fracture, TEM	SiC	500-800	10	FY-99	FY-99	
HFIR-HT-C1, -C2	ORNL		L.L. Snead	Thermal conductivity	Various insulators	80-350	0.01-1.0	Jun-95	Aug-95	
HFIR-HT-VV1	ORNL		L.L. Snead	Tensile TEM	316LN-IG, In 625	150	0.1-1.0	Jul-95	Sep-95	
High Flux Beam Reactor, Brookhaven National Laboratory										
HFBR-ISEC-3	ORNL		L.L. Snead	In-situ electrical	WESGO Al2O3	450	1.5	Jun-95	Jul-95	
HFBR-V1	ORNL		L.L. Snead	Tensile, fracture	V-4Cr-4Ti	75, 150, 225	0.5	May-95	Jun-95	
HFBR-V2	ORNL		L.L. Snead	Tensile, fracture	V-4Cr-4Ti	75, 225, 300, 375	0.5	Jul-95	Aug-95	
Advanced Test Reactor, Idaho Falls										
ATR-A1	ANL	MONBUSHO	D.L. Smith	Tensile, fracture toughness, TEM, creep	Vanadium alloys	200, 300	5	Jul-95	Jan-95	
BOR-60 Reactor, RIAR, Dimitrovgrad, Russia										
BOR-60-Fusion-1	ORNL, ANL	RDIPE, RIAR	A.F. Rowcliffe, D.L. Smith	Mechanical and microstructural properties	V alloys	350-380	10	Jul-95	Feb-96	
SM-2 Reactor, RIAR, Dimitrovgrad, Russia										
SM2-Phase 1	ORNL, PNL	RIAR	S.J. Zinkle	microstructural, and creep properties	Cu alloys	100, 200, 330	1, 5	Dec-93	Feb-94	
RBT-10 Reactor, RIAR, Dimitrovgrad, Russia										
RBT-10/1,2	PNL	SRIAR	D.J. Edwards	Mechanical behavior of bonded materials	Cu alloys/SS, Cu/Be	120, 300	0.2	Sep-95	Dec-95	
RBT-10/3,4,5	PNL	SRIAR	D.J. Edwards	Mechanical behavior of bonded materials	Cu alloys/SS, Cu/Be	100, 250	0.2	Jun-96	Oct-96	