

DISPLACEMENT DAMAGE CROSS SECTIONS FOR NEUTRON-RADIATED SILICON CARBIDE - H. L. Heinisch, L. R. Greenwood, W. J. Weber and R. E. Williford (Pacific Northwest National Laboratory)*

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EXTENDED ABSTRACT

Displacements per atom (DPA) is a widely used damage unit for displacement damage in nuclear materials. Calculating the DPA for SiC irradiated in a particular facility requires a knowledge of the neutron spectrum as well as specific information about displacement damage in that material. In recent years significant improvements in displacement damage information for SiC have been generated, especially the energy required to displace an atom in an irradiation event and the models used to describe electronic and nuclear stopping. Using this information, numerical solutions for the displacement functions in SiC have been determined from coupled integro-differential equations for displacements in polyatomic materials and applied in calculations of spectral-averaged displacement cross sections for SiC. This procedure has been used to generate spectrally averaged displacement cross sections for SiC in a number of reactors used for radiation damage testing of fusion materials, as well as the ARIES-IV conceptual fusion device. The table below lists the spectrally-averaged DPA cross-sections and DPA rates for SiC in several neutron environments.

Table 1. Spectrally averaged total DPA cross-sections, σ_{DPA} , in barns for SiC in several fission test reactors and a conceptual fusion reactor design incorporating SiC.

<u>Reactor</u>	<u>Position</u>	<u>σ_{DPA}, barns</u>	
		<u>Fe</u>	<u>SiC</u>
HFIR	PTP mid	191	158
ATR	midplane	302	260
HFR	C5	300	263
FFTF-MOTA	midplane	267	324
EBR-2	midplane	390	423
ARIES-IV	first wall	762	348

Table 2. Displacement damage rates in DPA per effective full power year (DPA/efpy) for SiC in several fission test reactors and a conceptual fusion reactor design incorporating SiC.

<u>Reactor</u>	<u>Position</u>	<u>DPA/efpy</u>	
		<u>Fe</u>	<u>SiC</u>
HFR	C5	12	11
ATR	midplane	14	12
EBR-2	midplane	25	27
HFIR	PTP mid	33	28
FFTF-MOTA	midplane	43	53
ARIES-IV	first wall	61	28

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