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# Characterization of dislocation loops in ferritic martensitic steels irradiated within the SPICE programme

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## The SPICE programme

Specimens of EUROFER97 prepared of impact tests have been irradiated up to an average dose of 16.3 dpa at irradiation temperatures of **250°C**, **300°C**, **350°C**, **400°C and 450 °C.** The neutron irradiation was performed in the HFR (High Flux Reactor, Petten, Netherlands). Neutron flux was 3.99 x10 18 m<sup>-2</sup>s<sup>-1</sup> (E>0.1 MeV). The TEM specimens were prepared and analyzed in the FML (Fusion Materials Laboratory) of the Hot Cell facility of KIT Campus North Karlsruhe.

EUROFER97											
Heat 83697											
Cr	w	Mn	V	Та	С						
9.81	1.08	0.48	0.2	0.14	0.12						
0	Р	S	N	Fe							
0.0008	0.005	0.004	0.02	bal.							

350°C / 16 dpa Irradiation

**Cavity formation** 

## 350°C / 16 dpa Irradiation

### Loop formation and determination of Burgers vector

	Weak beam dark-field imaging is used to determine the type of Burgers vector								
	g / b	% [111]	%[111]	% [111]	% [111]	[100]	[010]	[001]	AS AN AND AND AND AND AND AND AND AND AND
BROKENY AND DE	<b>1</b> 10	0	1	1	0	1	1	0	A state of the second
	110	1	0	0	1	1	1	0	A State of the second s
100 pm	020	1	1	1	1	0	2	0	The state of the
100 1111	200	1 la*hlua	1 lues for	1 a [001] -	1 heam dir	2 ection I	11	0	I THE SHOT AND A
0-20	/ * * * )	<ul> <li>Loop No. 1</li> <li>Invisible in [020] images</li> <li>Visible in [0-20] and [110] images</li> <li>The resulting Burges vector b is of [100]-type.</li> </ul>							
200	• •	Loop N	lo. 2						19 Maria
100 nm	<ul> <li>Invisible in [110] images</li> <li>Visible in [200] images</li> <li>The resulting Burges vector b is of [111]-type.</li> </ul>						<ul> <li>Factor</li> <li>Facto</li></ul>	teted Cavities were detected only in the ecimen irradiated at 350°C e size of the cavities varies from 10 nm to 3	

### **Conclusions:**

- The authors identified loops with a Burgers vector b of ½ [111] and [100] type in the 350°C irradiated material by using weak beam dark-field imaging in the TEM
- Typical loop size was measured to be in the range of 10 nm ([111]-type) and 50±15 nm ([100]-type)
- Cavities with a density of 1.2\*10<sup>20</sup> m<sup>3</sup> were observed in the sample after 350°C irradiation

[1] F. Luo et al. / Journal of Nuclear Materials 455 (2014) 339-342

KIT – University of the State of Baden-Wuerttemberg and National Research Center of the Helmholtz Association

This work, supported by the European Community, was carried out within the framework of the European Fusion Development Agreement. The views and opinions expressed herein do not necessarily reflect those of the European Commission.