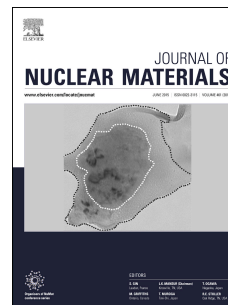


# Accepted Manuscript

Development of accident tolerant FeCrAl-ODS steels utilizing Ce-oxide particles dispersion

Hiroki Shibata, Shigeharu Ukai, Naoko H. Oono, Kan Sakamoto, Mutsumi Hirai



PII: S0022-3115(17)31197-2

DOI: [10.1016/j.jnucmat.2018.02.020](https://doi.org/10.1016/j.jnucmat.2018.02.020)

Reference: NUMA 50793

To appear in: *Journal of Nuclear Materials*

Received Date: 28 August 2017

Revised Date: 4 February 2018

Accepted Date: 11 February 2018

Please cite this article as: H. Shibata, S. Ukai, N.H. Oono, K. Sakamoto, M. Hirai, Development of accident tolerant FeCrAl-ODS steels utilizing Ce-oxide particles dispersion, *Journal of Nuclear Materials* (2018), doi: 10.1016/j.jnucmat.2018.02.020.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

**Development of accident tolerant FeCrAl-ODS steels  
utilizing Ce-oxide particles dispersion**

Hiroki Shibata <sup>a\*</sup>, Shigeharu Ukai <sup>b</sup>, Naoko H. Oono <sup>b</sup>, Kan Sakamoto <sup>c</sup>, Mutsumi Hirai <sup>c</sup>

<sup>a</sup> *Graduate School of Engineering, Hokkaido University, N13W8 Kita-ku, Sapporo  
060-8268, Japan*

<sup>b</sup> *Faculty of Engineering, Hokkaido University, N13W8 Kita-ku, Sapporo 060-8268, Japan*

<sup>c</sup> *Nippon Nuclear Fuel Development Co., LTD, 2163 Narita-cho, Oarai-machi  
Higashi-Ibaraki-gun, Ibaraki-ken, 311-1313 Japan*

E-mail of the corresponding author: [6shiro23@gmail.com](mailto:6shiro23@gmail.com) (Hiroki Shibata)

Tel.: +81-080-1810-5182

Fax: +81-11-706-6356

Email address:

Shigeharu Ukai (s-ukai@eng.hokudai.ac.jp)

Naoko H. Oono (n-oono@eng.hokudai.ac.jp)

Kan Sakamoto (kan.sakamoto@nfd.co.jp)

Mutsumi Hirai (mutsumi.hirai@nfd.co.jp)

**Abstract**

FeCrAl-ODS ferritic steels with Ce-oxide dispersion instead of Y-oxide were produced for the accident tolerant fuel cladding of the light water reactor. Excess oxygen (Ex.O) was added to improve the mechanical property. The tensile strength at Ex.O = 0 is around 200 MPa at 700 °C, mainly owing to dispersed Ce<sub>2</sub>O<sub>3</sub> particles in less than 10 nm size. The formation of the fine Ce<sub>2</sub>O<sub>3</sub> particles is dominated by a coherent interface with ferritic matrix. With increasing Ex.O, an increased of number density of coarser Ce-Al type oxide particles over 10 nm size is responsible for the improvement of the tensile strength. Change of the type of oxide particle, CeO<sub>2</sub>, Ce<sub>2</sub>O<sub>3</sub>, CeAlO<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub>, in FeCrAl-ODS steel was thermodynamically analyzed as a parameter of Ex.O.

**Key words:** ODS, Ce-oxide particles, ATF, Coherency

Download English Version:

<https://daneshyari.com/en/article/7963319>

Download Persian Version:

<https://daneshyari.com/article/7963319>

[Daneshyari.com](https://daneshyari.com)