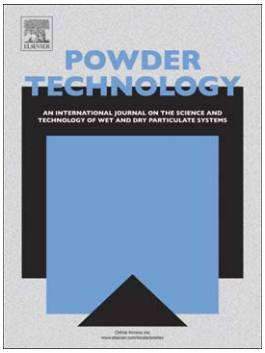


# Evolution of Al-containing phases in ODS steel by hot pressing and annealing

Qian Zhao, Liming Yu, Yongchang Liu, Yuan Huang, Qianying Guo, Huijun Li, Jiefeng Wu

PII: S0032-5910(17)30143-2
DOI: doi:10.1016/j.powtec.2017.02.016
Reference: PTEC 12354

To appear in: *Powder Technology*

Received date: 19 July 2016
Revised date: 13 December 2016
Accepted date: 9 February 2017

Please cite this article as: Qian Zhao, Liming Yu, Yongchang Liu, Yuan Huang, Qianying Guo, Huijun Li, Jiefeng Wu, Evolution of Al-containing phases in ODS steel by hot pressing and annealing, *Powder Technology* (2017), doi:10.1016/j.powtec.2017.02.016

# Evolution of Al-containing phases in ODS steel by hot pressing and annealing

Qian Zhao[a], Liming Yu[a*], Yongchang Liu[a*], Yuan Huang[a], Qianying Guo[a], Huijun Li[a], Jiefeng Wu[b]

[a)] State Key Lab of Hydraulic Engineering Simulation and Safety, School of Materials Science & Engineering, Tianjin University, Tianjin 300072, China

[b)] Institute of Plasma Physics, Chinese Academy of Sciences, Hefei 230031, China

**Abstract:** The crystal structures of $Al_2O_3$ and Y-Al-O particles in the as-hot pressed (as-hped) and as-heat treated oxide dispersion strengthened (ODS) steel were identified in this paper using high resolution transmission electron microscopy (HRTEM) techniques. The carbon extraction replicas were utilized to investigate the composition and crystal structure of the oxide particles in order to exclude the influence of the matrix. In the as-hped ODS steel, both of the γ-$Al_2O_3$ and α-$Al_2O_3$ particles with different size were identified, while, only the large α-$Al_2O_3$ particles were found in the as-heat treated ODS steel. In addition, $YAlO_3$ and $Y_3Al_5O_{12}$ with body-centred cubic structure were the mainly investigated Y-Al-O particles in the as-hped ODS steel, and large amounts of $Y_4Al_2O_9$ particles with a monoclinic structure generated in the ODS steel during annealing.

**Keywords:** Nuclear reactor materials; Mechanical alloying; Crystal structure; Transmission electron microscopy

*Corresponding authors.

E-mail: lmyu@tju.edu.cn (Liming Yu)

Tel & Fax: 0086-22-87401873 E-mail: licmtju@163.com (Yongchang Liu)