

In-Situ Formation of Y₂O₃ Particles in 316L ODS Steel Using YH₂

Jan Pokorný¹, Jiří Kubásek¹, Anna Dobkowska², Irena Paulin³, Črtomir Donik³,
Matjaž Godec³, David Nečas¹

¹University of Chemistry and Technology in Prague, Faculty of Chemical Technology, Department of Metals and Corrosion Engineering, Prague, Czech Republic

²Warsaw University of Technology, Faculty of Materials Science and Engineering, Warsaw, Poland

³Institute of Metals and Technology, Department of Physics and Chemistry of Materials, Ljubljana, Slovenia

E-mail: necasd@vscht.cz

The growing global demand for energy, combined with the need for environmentally friendly and efficient solutions, has highlighted Generation IV nuclear reactors as a promising path forward. These reactors require advanced structural materials capable of withstanding high temperatures and intense neutron irradiation. Oxide dispersion strengthened (ODS) steels are among the leading candidates due to their excellent thermal and radiation resistance [1-3]. This work investigates the preparation and characterisation of austenitic 316L stainless steel reinforced with yttria (Y₂O₃) particles formed in-situ using YH₂ as a precursor. The study examines how mechanical alloying time affects powder properties and the resulting microstructure after consolidation. The results show that alloying duration and precursor choice significantly impact phase composition and yttrium distribution. A 4-hour milling time was identified as optimal for achieving homogeneous dispersion while minimising powder loss. The findings confirm YH₂ as a suitable precursor for ODS steel, contributing to the development of materials for next-generation nuclear applications.

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