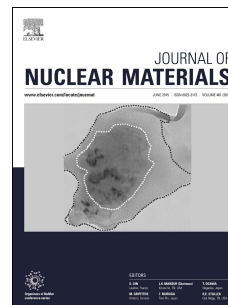


# Accepted Manuscript

Influence of kinetic effects on terminal solid solubility of hydrogen in zirconium alloys

Peter Kaufholz, Maik Stuke, Felix Boldt, Marc Péridis



PII: S0022-3115(18)30596-8

DOI: [10.1016/j.jnucmat.2018.08.011](https://doi.org/10.1016/j.jnucmat.2018.08.011)

Reference: NUMA 51134

To appear in: *Journal of Nuclear Materials*

Received Date: 27 April 2018

Revised Date: 27 July 2018

Accepted Date: 6 August 2018

Please cite this article as: P. Kaufholz, M. Stuke, F. Boldt, M. Péridis, Influence of kinetic effects on terminal solid solubility of hydrogen in zirconium alloys, *Journal of Nuclear Materials* (2018), doi: 10.1016/j.jnucmat.2018.08.011.

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.

# Influence of kinetic effects on terminal solid solubility of hydrogen in zirconium alloys

Peter Kaufholz\*, Maik Stuke, Felix Boldt, Marc Péridis

*GRS gGmbH, Forschungszentrum, Boltzmannstr.14, 85748 Garching, Germany*

---

## Abstract

The integrity of irradiated zirconium based nuclear fuel cladding is related to the precipitation of hydrides which is closely connected with the solubility of hydrogen. A review on the development of measurement technologies is given and the resulting terminal solid solubilities are reflected with respect to the established model of hydrogen solubility in zirconium alloys. The results often allow for a different interpretation than the established model. An alternative qualitative approach is proposed in which the fixed TSSp for the precipitation of zirconium hydrides is replaced by a kinetic model based on thermal history, total hydrogen content and the cooling rate. The influence of the modification of the model from a fixed TSSp to a kinetically limited TSSd is discussed with respect to the understanding of hydride embrittlement processes in long term storage.

*Keywords:* Hydrides, Zirconium, Terminal Solid Solubility, Spent Nuclear Fuel, Embrittlement

---

## 1. Introduction

A major prerequisite for the dry cask storage of spent nuclear fuel (SNF) is the exclusion of systematic cladding failure. The latter potentially influences storage, transport and necessary steps for the subsequent transfer of the SNF

---

\*Corresponding author

*Email address:* Peter.Kaufholz@grs.de, Maik.Stuke@grs.de, Felix.Boldt@grs.de, Marc.Peridis@grs.de (Peter Kaufholz\*, Maik Stuke, Felix Boldt, Marc Péridis)

Download English Version:

<https://daneshyari.com/en/article/7962926>

Download Persian Version:

<https://daneshyari.com/article/7962926>

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