

# Accepted Manuscript

Alpha radiation dosimetry using Fluorescent Nuclear Track Detectors

J.J.M. Kouwenberg, J.A. de Pooter, H.T. Wolterbeek, A.G. Denkova, A.J.J. Bos

PII: S1350-4487(17)30562-0

DOI: [10.1016/j.radmeas.2018.04.009](https://doi.org/10.1016/j.radmeas.2018.04.009)

Reference: RM 5898

To appear in: *Radiation Measurements*

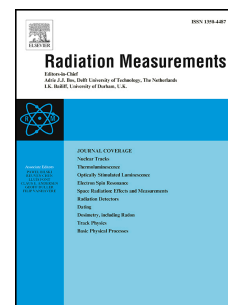
Received Date: 26 August 2017

Revised Date: 22 December 2017

Accepted Date: 11 April 2018

Please cite this article as: Kouwenberg, J.J.M., de Pooter, J.A., Wolterbeek, H.T., Denkova, A.G., Bos, A.J.J., Alpha radiation dosimetry using Fluorescent Nuclear Track Detectors, *Radiation Measurements* (2018), doi: 10.1016/j.radmeas.2018.04.009.

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.



# Alpha Radiation Dosimetry using Fluorescent Nuclear Track Detectors

*J.J.M. Kouwenberg\*, J.A. de Pooter, H.T. Wolterbeek, A.G. Denkova, A.J.J. Bos*

\*Corresponding author: Jasper J M Kouwenberg, Radiation, Science & Technology, Delft University of Technology. Mekelweg 15, Delft, the Netherlands. Email: [j.j.m.kouwenberg@tudelft.nl](mailto:j.j.m.kouwenberg@tudelft.nl)

## ABSTRACT

To answer the need for better tools for alpha radiation radiobiology and microdosimetry research, a novel irradiation setup based on a honeycomb collimator, in combination with Fluorescent Nuclear Track Detectors (FNTD) for alpha radiation dosimetry and spectroscopy, was introduced. FNTDs are a novel type of small, crystalline detector that can visualize individual alpha particles and simultaneously measure their location, velocity direction and energy with good accuracy. The performance of FNTDs for alpha radiation dosimetry was evaluated for the first time and the results were compared to extrapolation chamber measurements and simulations. The surface dose rate to water of the irradiation setup for two different honeycomb collimators, measured using FNTDs, agreed with the extrapolation chamber measurements within 6%. The simulations underestimated the surface dose rate to water for the first collimator and overestimated the dose for the second collimator, indicating the sensitivity to manufacturing errors in the collimators of this irradiation setup. The dose homogeneity in the setup was measured using radiochromic film and showed variations of less than 5%, making this setup, in combination with the rich information obtained regarding the spatial, angular and energy distributions of the alpha particles, obtained using the FNTDs, ideal for microdosimetry and radiobiology experiments. The accuracy and ease-of-use of FNTDs in addition to the surface or absorbed dose and

Download English Version:

<https://daneshyari.com/en/article/8249813>

Download Persian Version:

<https://daneshyari.com/article/8249813>

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