

JOINT RESEARCH CENTRE
Directorate F – Health, Consumers and Reference Materials

CERTIFICATE OF ANALYSIS

ERM[®]-FD103

| TITANIUM DIOXIDE NANORODS IN 1-BUTANOL | | | |
|---|--------------------------|---------------------------------------|-----------------------------------|
| Size parameter | Weighting / Averaging | Certified value ²⁾ [nm] | Uncertainty ³⁾ [nm] |
| Minimum Feret diameter ¹⁾ (F _{min}) | Number-weighted / mode | 16.0 | 0.9 |
| | Number-weighted / median | 16.1 | 0.9 |
| Maximum Feret diameter ¹⁾ (F _{max}) | Number-weighted / mode | 53.5 | 2.6 |
| | Number-weighted / median | 54.0 | 2.4 |
| Maximum inscribed circle diameter ¹⁾ | Number-weighted / mode | 15.1 | 0.7 |
| | Number-weighted / median | 15.1 | 0.7 |
| Area-equivalent diameter ¹⁾ (ECD) | Number-weighted / mode | 29.8 | 1.2 |
| | Number-weighted / median | 29.9 | 1.3 |
| Shape parameter | Weighting / Averaging | Certified value ²⁾ | Uncertainty ³⁾ |
| Aspect ratio ¹⁾ (F _{min} /F _{max}) | Number-weighted / mode | 0.298 | 0.018 |
| | Number-weighted / median | 0.296 | 0.013 |
| ¹⁾ As obtained with transmission and scanning electron microscopy and applying ISO 13322-1:2014 (image analysis), counting particles within the ranges: 5 nm – 35 nm (F _{min} and maximum inscribed diameter), 10 nm – 50 nm (ECD), 10 nm – 90 nm (F _{max}) and 0.100 – 0.550 (aspect ratio). ²⁾ Unweighted mean value of the means of accepted sets of data; each set being obtained in a different laboratory and/or with a different technique. The certified value and its uncertainty are traceable to the International System of Units (SI). ³⁾ The uncertainty of the certified value is the expanded uncertainty with a coverage factor $k = 2$ corresponding to a level of confidence of about 95 % estimated in accordance with ISO/IEC Guide 98-3, Guide to the Expression of Uncertainty in Measurement (GUM:1995), ISO, 2008. | | | |

This certificate is valid for one year after purchase.

Sales date:

The minimum amount of sample to be used is 5 µL, at least 100 particles have to be counted.

Geel, July 2019

Signed: 

Dr Doris Florian
Head of Unit Reference Materials
European Commission, Joint Research Centre
Directorate F – Health, Consumers and Reference Materials
Retieseweg 111
B-2440 Geel, Belgium

DESCRIPTION OF THE MATERIAL

ERM-FD103 consists of titanium dioxide nanorods in 1-butanol. The material is available in 5 mL pre-scored glass ampoules containing approximately 2 mL of suspension.

ANALYTICAL METHODS USED FOR CERTIFICATION

Transmission electron microscopy (TEM)

Scanning electron microscopy (SEM)

PARTICIPANTS

Agfa Gevaert NV, Agfa-Labs, Mortsel, BE

Evonik Technology & Infrastructure GmbH, Essen, DE

Industrial Technology Research Institute (ITRI), Hsinchu, TW

National Institute of Standards and Technology (NIST), Gaithersburg, US

National Measurement Institute Australia (NMIA), Lindfield, AU

MVA Scientific Consultants, Duluth, US

(measurements under the scope of ISO/IEC 17025 accreditation; A2LA 2096.01)

Sciensano, Service Trace Elements and Nanomaterials, Brussels, BE

University of Namur, Namur, BE

SAFETY INFORMATION

This material should be handled with care. Nanoparticles can have an impact on environment and human health. Any spillage of the suspension should be handled according to the usual laboratory safety measures.

For further details refer to the safety data sheet.

INSTRUCTIONS FOR USE AND INTENDED USE

The intended use is to check the performance of instruments and/or methods that characterise the morphology (i.e. size and shape) of nanorods (particles with two external dimensions in the size range of approximately 1 nm to 100 nm) that are deposited onto a suitable flat substrate. The certified values that have been assigned are regarded as reliable estimates of the true values and ERM-FD103 can therefore be used for calibration purposes. As a result of the material synthesis process and the physicochemical conditions of the suspension, agglomerates can be expected.

Before opening, the ampoule should be gently inverted several times to ensure the homogeneity of the suspension and to re-suspend any settled particles. Remove any suspension that remains in the upper part (conical tip) of the ampoule by gently flicking the conical part with the forefinger while tilting the ampoule. The ampoule is pre-scored and can be opened by applying moderate pressure with one's thumb to snap off the conical part. The contents of an ampoule should be used the same day as opened.

Electron microscopy method:

At least 5 μ L of the as-received material must be transferred to a suitable grid/substrate. The use of ultrasonic energy must be avoided as this may irreversibly compromise the integrity of the material. After drying, at least 100 particles (not overlapping) need to be analysed. If necessary, ERM-FD103 can be diluted with anhydrous 1-butanol (purity \geq 99.8 %) before transferring the particles to the grid/substrate.

STORAGE

The material shall be stored at $18\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ in the dark.

However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

LEGAL NOTICE

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NOTE

A detailed certification report is available at <https://crm.jrc.ec.europa.eu/>.

A paper copy is obtainable from the Joint Research Centre, Directorate F – Health, Consumers and Reference Materials on request.



European Commission – Joint Research Centre
Directorate F – Health, Consumers and Reference Materials
Retieseweg 111, B - 2440 Geel (Belgium)
Telephone: +32-(0)14-571.705 - Fax: +32-(0)14-590.406
jrc-rm-distribution@ec.europa.eu