

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

REFERENCE MATERIAL CERTIFICATE

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 17034:2016 and ISO Guide 35:2017.

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
Latest revision: May 2021

INFORMATION ONLY

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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

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

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SAFETY INFORMATION

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

For further details refer to the safety data sheet.

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.

INSTRUCTIONS FOR USE

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 μL 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.

Dispose in accordance with good laboratory practice.

For general information on handling of reference materials, please see ERM Application Note 6, available on <https://crm.jrc.ec.europa.eu/e/132/User-support-Application-Notes>.

STORAGE

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

For more information regarding the shelf life of reference materials please see ERM Application Note 7, available on <https://crm.jrc.ec.europa.eu/e/132/User-support-Application-Notes>.

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.

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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.



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