

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

# REFERENCE MATERIAL CERTIFICATE

## ERM<sup>®</sup> - FD306

SILICA PARTICLES IN AQUEOUS SOLUTION		
	Certified value <sup>3)</sup>	Uncertainty <sup>4)</sup>
Mean electrophoretic mobility <sup>1)</sup> ( $\times 10^{-8} \text{ m}^2 \text{ V}^{-1} \cdot \text{s}^{-1}$ )	-4.3	0.3
Mean zeta potential (mV) <sup>2)</sup>	-56	4
<p><sup>1)</sup> As obtained with electrophoretic light scattering (ELS) at a sample temperature of 25 °C and by applying ISO 13099-2:2012.</p> <p><sup>2)</sup> As calculated from the certified electrophoretic mobility value using the Smoluchowski approximation <math>f(\kappa a) = 1.5</math> (for a temperature of 25 °C, a dynamic viscosity of 0.89 mPa·s and a value of 78.4 for the dielectric constant of water).</p> <p><sup>3)</sup> Certified values are values that fulfil the highest standards of accuracy and represent the unweighted mean value of the means of accepted sets of data; each set being obtained in a different laboratory or with a different method of determination. The certified value and its uncertainty are traceable to the International System of units (SI).</p> <p><sup>4)</sup> The uncertainty of the certified value is the expanded uncertainty with a coverage factor <math>k = 2</math> corresponding to a level of confidence of about 95 % estimated in accordance with ISO 17034:2016 and ISO Guide 35:2017.</p>		

This certificate is valid for one year after purchase.

Sales date:

The minimum amount of sample to be used is 200 µL.

**Note:** This material is a joint production of the European Commission's Joint Research Centre (JRC) and the US National Institute of Standards and Technology (NIST). ERM-FD306 is identical to NIST SRM 1993.

Geel, October 2020

Signed: 

Dr Robert Koeber  
Head of Unit Reference Materials  
European Commission, Joint Research Centre  
Directorate F – Health, Consumers and Reference Materials  
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<b>Additional Material Information</b>	
	Value (at 25°C)
Mean zeta potential <sup>1)</sup>	-54.7 mV
Mean dynamic electrophoretic mobility <sup>2)</sup>	$-5.4 \times 10^{-8} \text{ m}^2\text{V}^{-1}\text{s}^{-1}$
Conductivity <sup>3)</sup>	0.42 mS/cm
1) Mean value of the average six data sets as obtained by electroacoustic method. 2) Mean value of the average five data sets as obtained by electroacoustic method. 3) Mean of the conductivity measurement results reported by the laboratories.	

## DESCRIPTION OF THE MATERIAL

ERM-FD306 consists of a suspension of silica particles at a mass fraction of 22 g/kg in a borate buffer at pH 8.9. The material is available in 25 mL pre-scored ampoules containing approximately 25 mL of suspension.

## ANALYTICAL METHODS USED FOR CHARACTERISATION

Electrophoretic light scattering (ELS)

Electroacoustics

## PARTICIPANTS

The participants in the interlaboratory comparison study were (list alphabetical order)

Anton Paar GmbH, Graz, AT

Colloidal Dynamics LLC, Ponte Vedra Beach, USA

Dispersion Technology Inc., Bedford Hills, USA

European Commission, Joint Research Centre, Directorate F – Health, Consumers and Reference Materials, Geel, BE

(measurements under the scope of ISO/IEC 17025 accreditation BELAC 268-TEST)

Fraunhofer Institut für Keramische Technologie and Systeme (IKTS), Dresden DE  
(Measurements under the scope of ISO/IEC 17025 accreditation DAKKS D-PL-11140-15-00)

Horiba, Palaiseau, FR

Malvern Panalytical Ltd, Malvern, UK

Malvern Panalytical Inc., Westborough, USA

Microtrac Inc., Montgomeryville, USA

Moscow Institute of Physics and Technology, Moscow, RU

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

National Metrology Institute of Japan (NMIJ), Tsukuba, JPN

National Physical Laboratory (NPL), Teddington, UK

Otsuka Electronics, Osaka, JPN

Takeda Colloid Techno-Consulting Co Ltd., Osaka, JPN

Wyatt Technology, Santa Barbara, USA

3P instruments GmbH & Co.KG, Odelzhausen, DE

## SAFETY INFORMATION

The material should be handled with care. The material contains a fraction of nanoparticles (size range of 1 nm to 100 nm) that could have an impact on environment and human health. Any spillage of the suspension should be handled according to the standard laboratory safety precautions.

For further details refer to the safety data sheet.

## INTENDED USE

The main purpose of this material is to calibrate electroacoustic methods for zeta potential determination and to assess performance of instruments and/or methods that are used for measuring zeta potential and electrophoretic mobility. As with any reference material, it can be used for establishing control charts or validation studies.

### Use as a calibrant

The material can be used as a calibrant. The uncertainty of the certified value shall be taken into account in the estimation of the measurement uncertainty.

## 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 top) 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 gentle pressure with one's thumb to snap off the conical part. The content of the ampoule should be used the same day as opened and should be gently homogenised before every measurement without introducing air bubbles.

ELS and Electroacoustic method: Aliquot of ERM-FD306/SRM 1993 should be measured as received, i.e. without dilution. The measurement temperature shall be  $25\text{ °C} \pm 0.2\text{ °C}$ . Values to be used for the viscosity and refractive index of the dispersing medium (water) at  $25\text{ °C}$  are  $0.89\text{ mPa}\cdot\text{s}$  and  $1.332$ , respectively. The value of the viscosity must be adjusted when tests are not performed at  $25\text{ °C}$ .

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 materials should be stored at ambient temperature ( $20 \pm 5\text{ °C}$ ). Ampoules must not be allowed to freeze, as this will irreversibly compromise the integrity of the material.

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>. Please note that the stability of opened samples has not been tested and repeated use of the material occurs under the responsibility of the user. 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 can be obtained from the Joint Research Centre, Directorate F – Health, Consumers and Reference Materials on request.



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