Certificate of the Reference Material

Name of the Material	:	Porous SiO_2
Material Code	:	UME CRM 1503
Issue Date	:	11.10.2021
Revision Date	:	22.10.2025 (Revision history can be found on the last page)
Validity Period of the Certificate	:	12 months from the sales date
Certified Values	:	

Parameter	Certified Value [2]	Uncertainty [3]
BET Specific Surface Area [1]	377.9 $m^2\ g^{-1}$	5.6 $m^2\ g^{-1}$

[1] Specific surface area calculated in a relative adsorption pressure range $0.01 \leq p/p_0 < 0.35$ as multi point BET (Brunauer, Emmet and Teller) model described in ISO 9277.

[2] The certified value is the mean value of total 18 measurement results obtained from four units by two laboratories, using ISO 9277 method.

[3] The expanded uncertainty of certified value includes characterization, homogeneity, stability components and is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$. The standard uncertainty of measurement has been determined in accordance with GUM "Guide to the Expression of Uncertainty in Measurement".

TÜBİTAK UME has been accredited by TÜRKAK as a reference material producer under the accreditation number AB-0001-RM in accordance with the TS EN ISO 17034:2018 standard.

Turkish Accreditation Agency (TÜRKAK) is a signatory to the European Cooperation for Accreditation (EA) Multilateral Agreement (MLA) and the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the recognition of reference material certificates.

Sales Date

Assoc. Prof. Mustafa ÇETİNTAŞ
Director

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Description

Material is a white solid powder of 5 g porous silicon dioxide (SiO_2) in a screw-capped brown glass bottle. Additional information is given in the certification report.

Intended Use

The reference material is intended to be used for the calibration, verification and control of instruments used for determination of the BET specific surface area by static manometric (volumetric) method.

Instructions for Use

Before opening and taking a sample, the bottle should be shaken to re-homogenize the content. Minimum sample intake is 200 mg. After use, the bottle should be immediately and tightly recapped.

Outgassing of the sample (200 - 500 mg) has to be carried out in a vacuum. Starting from room temperature, the sample has to be heated up to 350 °C (623.15 K) in vacuum with a rate of 5-10 °C/min followed by degassing the sample at 350 °C for at least 6 hours. The final pressure should be 1-5 Pa. The measurements should be carried out at a temperature of -195.85 °C (77.3 K) using N_2 as probe gas. The first isotherm data point should be taken at P/P_0 = 0.01, and the last isotherm data point should be taken at P/P_0 = 0.35.

Details of the multipoint BET value calculation are presented in the certification report.

Storage Conditions

The material should be stored at (21 ± 3) °C in a dry place.

This material can be safely dispatched under conditions where the temperature does not exceed 18 °C for up to four weeks.

TÜBİTAK UME cannot be held responsible for changes that might happen to the material at customer's premises due to non-compliance with the instructions for use, and the storage conditions given in the certificate.

Safety Information

The usual laboratory safety measures apply as in the case of similar powders.

It is strongly recommended that the material must be handled and disposed according to the safety guidelines where applicable.

It is recommended to avoid inhalation of powder material and work under appropriate ventilation conditions, gloves and dust masks should be used. Please refer to the Safety datasheet (SDS) before any use of the material.

Participants

The laboratories participated in the characterization study are given in the table below.

Laboratory	Address
TÜBİTAK UME	TÜBİTAK Gebze Yerleşkesi, Barış Mahallesi, Dr. Zeki Acar Caddesi No.1, 41470 Gebze - Kocaeli / Türkiye
UNIIM	Ural Research Institute for Metrology, Krasnoarmeyskaya Ulitsa, 4, Yekaterinburg, Sverdlovsk Oblast, 620000, Russia

Methods and/or Techniques Used for the Determination of the Certified Values

Methods and techniques used in characterization studies are given below.

Method/Technique	Parameter
ISO 9277 Brunauer, Emmet and Teller (BET) model	BET Specific Surface Area ($m^2\ g^{-1}$)

Commutability

The equivalence of the mathematical relationships among the results of different measurement procedures for an RM and for representative samples of the type intended to be measured is given.

Revision History

Date	Remarks
11.20.2021	First issue.
28.11.2024	Certificate is updated to adapt it to with the current format of certificate for reference materials.
22.10.2025	Certificate has been reviewed and confirmed for compliance with the current ISO 9277:2022 method.