National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan

Reference Material Certificate

NMIJ CRM 6004-a
No. +++

17β-Estradiol

This certified reference material (CRM) is produced in accordance with the NMIJ's management system and is in compliance with ISO 17034 and ISO/IEC 17025. This CRM is intended for the calibration of analytical instruments, quality control of analytical instruments, and validating analytical techniques.

Certified Value

The certified value of this CRM is given in the table below. The uncertainty of the certified value is the expanded uncertainty obtained by multiplying the combined standard uncertainty by a coverage factor (k) of 2, and it is the half-width of an interval estimated to have a level of confidence of approximately 95 %.

	CAS No.	Certified value, Mass fraction (kg/kg)	Expanded uncertainty, Mass fraction (kg/kg)
17β-Estradiol (Estra-1,3,5(10)-triene-3,17β-diol)	50-28-2	0.984	0.003

Analysis

The certified value of this CRM was the weighted mean of purities (in mass fraction) determined by the mass balance approach and the quantitative nuclear magnetic resonance (qNMR) method. In the mass balance approach, impurities were analyzed using a high-performance liquid chromatograph with an ultraviolet detector (HPLC-UV), a high-performance liquid chromatograph with a corona-charged aerosol detector (HPLC-CAD), Karl-Fischer titrator (KF), a head space-gas chromatograph-mass spectrometer (HS-GC-MS), and a thermogravimeter (TG). The combined standard uncertainty was estimated by the combination of standard uncertainties due to purity determinations by the mass balance approach and by the qNMR method, differences between the methods, homogeneity and stability.

Metrological Traceability

The certified value was determined by mass balance approach and qNMR. Organic impurities were determined with HPLC-UV, HPLC-CAD, and HS-GC-MS by using calibration solutions gravimetrically prepared from pure materials assessed in NMIJ. The water content was determined by the coulometry with Karl-Fischer titratior, which is one of the primary methods of measurement. Ignition residue was determined with a combination of TG and weights calibrated by Japan Calibration Service System (JCSS). The mass fraction of 17β-estradiol was determined with NMR by using 1,4-bis(trimethylsilyl)benzene calibrated based on NMIJ CRM 4039-a(1,4-dichlorobenzene) in NMIJ, as an internal standard. The certified value, therefore, is traceable to the International System of Units (SI).

Mutual Recognition Arrangement under Metre Convention

The certified value of this CRM is recognized for international equivalence based on the Mutual Recognition Arrangement under the Metre Convention (CIPM MRA). The calibration measurement capability (capabilities) (CMC) of NMIJ related to this CRM is registered in the Key Comparison Database (KCDB) (see https://www.bipm.org/kcdb/) of the International Bureau of Weights and Measures (BIPM).

Expiration of Certification

This certificate is valid for one year from the date of shipment, provided that the material remains unopened and is stored in

accordance with the instructions given in this certificate.

Description of the Material

This CRM is 17β-estradiol and in the form of a white powder at room temperature. This CRM of ca. 300 mg in net volume is kept in an amber glass vial with argon gas. The vial is sealed in an aluminum-laminated bag filled with argon gas.

Instructions for Storage

This CRM should be stored at a temperature of 2 °C to 8 °C, and protected from light.

Instructions for Use

This CRM is for laboratory use only. The vial of this CRM should be allowed to warm to room temperature before opening. This CRM is hygroscopic and should be used promptly once the vial is opened. Considering the homogeneity, a minimum sample mass of 20 mg should be used to ensure valid results.

Precautions for Handling

Wear personal protective equipment such as safety glasses, safety mask, and safety gloves in handling. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

This CRM was purified and subdivided by Wako Pure Chemical Industries, Ltd. This CRM was prepared by purifying a commercial high-purity reagent. 300 mg of purified 17β-estradiol is contained within the amber glass vial in argon atmosphere.

Technical Information

The mass fraction of 1,3,5,6,8-estrapenten-3,17β-estradiol, 6-dehydro-17β-estradiol, 17α-estradiol, 1-methyl-17β-estradiol, estrone, 4-methyl-17β-estradiol, 3-methyl-17β-estradiol, water, and ethanol were 0.28 g/kg, 0.08 g/kg, 0.13 g/kg, 0.34 g/kg, 1.13 g/kg, 4.9 g/kg, 0.04 g/kg, 7.5 g/kg, and 0.07 g/kg, respectively at the certification time.

NMIJ Analysts

The technical manager for this CRM is KATO K., the production manager is YAMAZAKI T., and the analysts are SHIMIZU Y., SAITO T., KITAMAKI Y., YAMAZAKI T., OHTE Y. and NAKAMURA S.

Information

If substantive technical changes occur that affect the certification before the expiration of this certificate, NMIJ will notify the registered customer. Customer registration on the NMIJ Website (given below) will facilitate notification. Technical reports regarding this CRM can be obtained from the contact details given below.

Reproduction of Certificate

In reproducing this certificate, it should be clearly indicated that the document is a copy.

April 1, 2020

ISHIMURA Kazuhiko
President
National Institute of Advanced Industrial Science and Technology

If you have any questions about this CRM, please contact:
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Revision history	
April 1, 2015:	"Metrology Management Center" was renamed to "Center for Quality Management of Metrology."
November 11, 2015:	The description in "Expiration of Certification" was changed to "one year after the date of shipment"
	The description of uncertainty of stability was added.
	The description on Mutual Recognition Arrangement under Meter Convention was added.