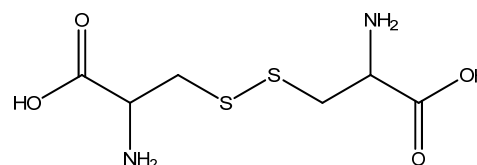


## Certificate of Analysis – Certified Reference Material

## L-Cystine

TraceCERT®  
Traceable Certified Reference Materials

**Product no.:** 49603  
**Lot no.:** BCCD1578  
**Description of CRM:** solid neat material  
**Expiry date:** JUN 2024  
**Storage:** 15-25°C; storage under Argon  
**Chemical formula:** C<sub>6</sub>H<sub>12</sub>N<sub>2</sub>O<sub>4</sub>S<sub>2</sub>  
**Molecular mass:** 240.30 g/mol  
**CAS No.:** 56-89-3



Sample

**Certified value ± Expanded uncertainty,  
 $U = k \cdot u$  ( $k = 2.6$ )<sup>[1][2]</sup>  
 as mass fraction (g/g)  
 (non-stereo specific)**

Cystine

**98.9 % ± 0.8 %**

**Metrological traceability:** NIST SRM 84I (KHP)<sup>[3]</sup>  
 Details see "Certification process details" on page 2.

**Measurement method:** The certified value is established by high-resolution quantitative NMR measurements (qNMR).

**Intended use:** Use this certified reference material (CRM) as calibrant for chromatography or any other analytical technique.

**Minimum sample size:** The sample is solid at room-temperature. 20 mg is recommended as the minimum sample size. If less material is used, it is recommended to increase the certified uncertainty by a factor of two for half of sample and a factor of four for a quarter of sample.

**Instructions for handling and correct use:** This material does not require drying before use. The CRM should be stored in the original bottle. After use the bottle should be tightly closed and protected from excessive moisture and light.

**Accreditation:** Sigma-Aldrich Production GmbH is accredited by the Swiss accreditation authority SAS as registered reference material producer SRMS 0001 in accordance with ISO 17034 and registered testing laboratory STS 0490 according to ISO/IEC 17025.<sup>[4][5]</sup>

**Certificate issue date:** 10 JUL 2020



ISO 17034  
SRMS 0001



ISO/IEC 17025  
STS 0490



ISO 9001  
005356 QM08

Dr. A. Rück – CRM Operations

Dr. P. Zell – Approving Officer



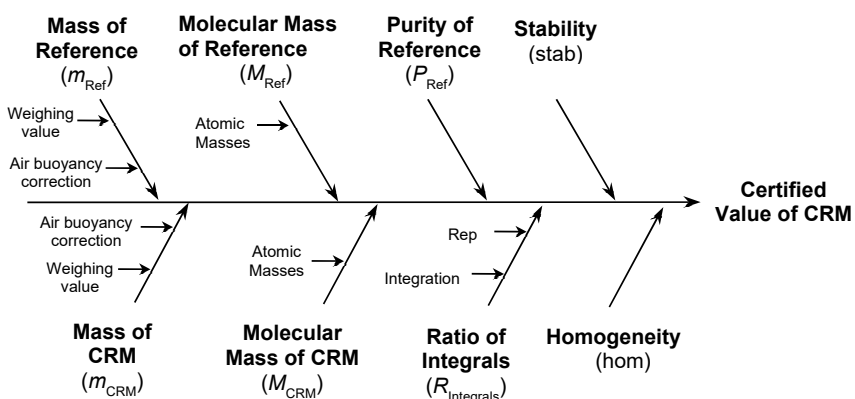


## Uncertainty evaluation:

The uncertainty contributions are illustrated by the following cause-effect diagram.

Typical relative contributions are:

$u(P_{\text{Ref}})$	< 0.10 %
$u(m_{\text{Ref}})$	< 0.05 %
$u(m_{\text{CRM}})$	< 0.05 %
$u(M_{\text{Ref}})$	< 0.003 %
$u(M_{\text{CRM}})$	< 0.003 %
$u(R_{\text{Integrals}})$	< 0.20 %
$u_{\text{hom}}$	< 0.10 %
$u_{\text{stab}}$	< 0.03 %



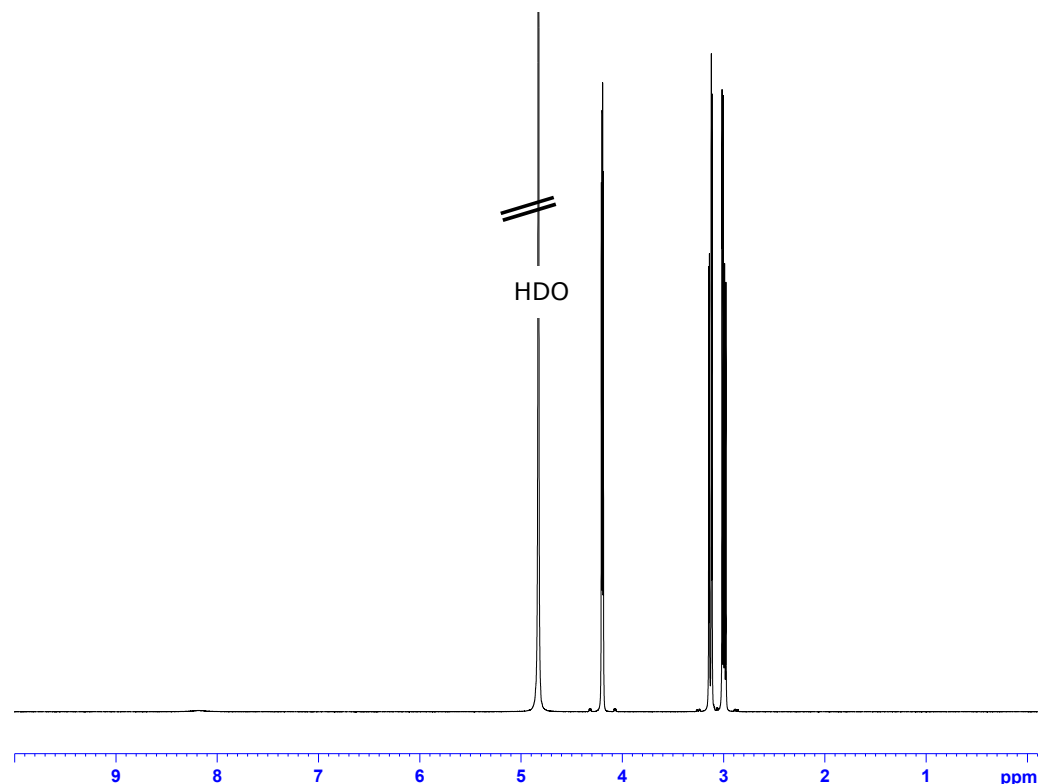
The combined standard uncertainty is calculated by combination of the standard uncertainties of the input estimates according to Eurachem/CITAC Guide "Quantifying Uncertainty in Analytical Measurement" and ISO 17034.<sup>[2][4]</sup>

Expanded uncertainty is then calculated to a confidence level of 95%, typically by multiplying with a confidence level factor of  $k=2.6$ .

## Indicative values:

<b>mp</b>	>240°C (dec.) (lit.)
<b>Optical activity</b>	$[\alpha]_{\text{D}}^{20} = -219^\circ$ , $c = 1 \%$ in 1 M HCl (lit.)

## $^1\text{H-NMR}$ Spectrum (600 MHz, Cystine in $\text{D}_2\text{O}/\text{DCI}$ )



## References:

- [1] ISO Guide 35:2017, "Reference materials - Guidance for characterization and assessment of homogeneity and stability"
- [2] Eurachem/CITAC Guide, 3<sup>rd</sup> Ed. (2012), "Quantifying uncertainty in analytical measurement"
- [3] Eurachem/CITAC Guide, 1<sup>st</sup> Ed. (2003), "Traceability in chemical measurement"
- [4] ISO 17034:2016, "General requirements for the competence of reference material producers"
- [5] ISO/IEC 17025:2017, "General requirements for the competence of testing and calibration laboratories"
- [6] Weber M, Hellriegel C, Rueck A, Sauermoser R, Wuethrich J, Accred. Qual. Assur. 18 (2013) 91-98
- [7] ISO Guide 31:2015, "Reference materials - Contents of certificates, labels and accompanying documentation"
- [8] Weber M, Hellriegel C, Rueck A, Wuethrich J, Jenks P, JPBA 93 (2014) 102-110

## Certificate of analysis revision history:

Certificate version	Date	Reason for version
01	10 JUL 2020	Initial version

## Disclaimer:

The purchaser must determine the suitability of this product for its particular use. Sigma-Aldrich Production GmbH makes no warranty of any kind, express or implied, other than its products meet all quality control standards set by Sigma-Aldrich Production GmbH. We do not guarantee that the product can be used for a special application.

