



Object of certification: **HYDRANAL™ CRM Water Standard 1.0**

Product no.: **34426**

Lot no.: **H051A**

เป็น Water Standards ชนิดที่เป็น CRM หรือวัสดุอ้างอิงรับรอง

Composition: This certified reference material (CRM) is a solution of water in a mixture of anisole and propylene carbonate, which is certified for its water content. One unit consists of ten 5 mL glass ampoules, each containing a volume of approximately 4 mL.

Intended use: We recommend the use of this CRM for validation of methods, calibration of instruments and titer determination for the measurement of water (Karl Fischer titrators).

Storage and handling: This CRM is sealed under argon and should be stored at room temperature (approx. 20°C ± 5°C). Before use of the material, the ampoule must be shaken well and its temperature should be room temperature. After opening the ampoule, samples should be transferred into a dry glass syringe (first rinse the syringe with a small portion of CRM) and used immediately. We do not recommend using partially used ampoules after opening.

Minimum sample weight: There is no recommended minimum sample amount. The CRM is liquid at room temperature and therefore homogeneous under these conditions. A potential inhomogeneity between different ampoules within one production lot is covered by the expanded measurement uncertainty.

QC release date: 13/Sep./2017

มีการทดสอบความเป็นเนื้อเดียวกันและความเสถียร

Lot related Production date: 20/Feb./2017

Expiry date: 05/Feb./2020 - วันหมดอายุ

วันผลิต

The certified value is determined under **double-accreditation** in accordance with **ISO/IEC 17025** [2] and also **ISO Guide 34** [3]. Extensive homogeneity and stability tests are considered for certification.

ได้รับรองมาตรฐาน ISO/IEC 17025 และ ISO Guide 34

Certified value and uncertainty according to ISO Guide 35 [4] and Eurachem/CITAC Guide		
Constituent	Certified water content (mass fraction) รับรองค่าปริมาณน้ำ	Expanded uncertainty (mass fraction), $U = k \cdot u_c$ ( $k = 2$ )
<b>Water</b>	<b>1.004 mg/g</b>	<b>0.011 mg/g</b> ค่าความไม่แน่นอนในการขยายตัว

Certification body:

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Thomas Wendt (Supervisor, HYDRANAL)



Quality management:

*Katja Vogler*  
Katja Vogler (Quality Manager, HYDRANAL)

# CERTIFICATION REPORT

## 1. Production

Honeywell Specialty Chemicals Seelze GmbH (Germany) produced the certified reference material **HYDRANAL™ CRM Water Standard 1.0**, product no. 34426, lot no. H051A as water standard.

A mixture of anisole and propylene carbonate was spiked with water (Ph Eur quality) and stirred for several hours at room temperature until the whole production batch was homogenous. A total number of 10'500 glass ampoules were filled by dispensing aliquots of approximately 4 mL of batch material into argon filled ampoules and flame sealed.

## 2. Assignment of property value

The determination of the water content ( $w_{\text{CRM}}$ ) for the whole production batch was performed on eleven systematically chosen ampoules, selected throughout the filling process, applying the coulometric Karl Fischer titration with a cell with diaphragm using Hydranal Coulomat AG (product no. 34836) and Hydranal Coulomat CG (product no. 34840). All measurements were performed on 04/Jul./2017 in a temperature range of  $22^{\circ}\text{C} \pm 4^{\circ}\text{C}$  using two different coulometric instruments and are directly traceable to SI unit<sup>[6]</sup>. Additionally the certified value is verified against SRM 2890 (Water Saturated 1-Octanol) from National Institute of Standards & Technology (NIST) and CRM 4222 (Water in Mesitylene) from National Metrology Institute of Japan (NMIJ). Both standards have to be confirmed within their stated uncertainty.

## 3. Homogeneity study

The assessment of homogeneity for the whole production batch was investigated simultaneously with the assignment of a property value as described in part 2. No trend or statistically significant variation in the water content was detected within the filling process. Results from analysis of variance (ANOVA) are considered for the uncertainty contribution ( $u_{\text{hom}}$ ) due to inhomogeneity of the CRM.

## 4. Stability study

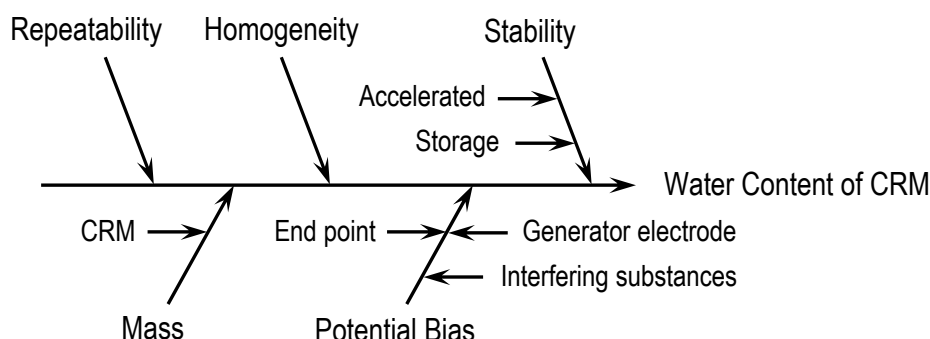
Accelerated stability tests at  $50^{\circ}\text{C}$  are performed after 1, 3 and 9 months. These tests consider worst-case conditions that may appear during transportation and these data are also used for the estimation of shelf-life. Long-term stability tests at the recommended storage temperature are performed covering the entire shelf life of the CRM. For all stability measurements, coulometric Karl Fischer titrations are applied.

## 5. Uncertainty estimation

All uncertainties are calculated according to Eurachem/CITAC Guide and reported as combined expanded uncertainty. The expanded uncertainty is calculated to a confidence level of 95% by multiplying with a confidence level factor of  $k = 2$ . The combined uncertainty of the certified reference material ( $u_{\text{CRM}}$ ) is calculated by combination of the squared contribution values for the uncertainties of the water content ( $u_{\text{char}}$ ), homogeneity ( $u_{\text{hom}}$ ) and stability ( $u_{\text{stab}}$ ).

$$u_{\text{CRM}} = \sqrt{u_{\text{char}}^2 + u_{\text{hom}}^2 + u_{\text{stab}}^2}$$

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



### References

- [1] ISO Guide 31:2000, "Reference materials - Contents of certificates and labels"
- [2] ISO/IEC 17025:2005, "General requirements for the competence of testing and calibration laboratories"
- [3] ISO Guide 34:2009, "General requirements for the competence of reference material producers"
- [4] ISO Guide 35:2006, "Reference materials - General and statistical principles for certification"
- [5] Eurachem/CITAC Guide, 3<sup>rd</sup> Ed. (2012), "Quantifying uncertainty in analytical measurement"
- [6] Eurachem/CITAC Guide, 1<sup>st</sup> Ed. (2003), "Traceability in chemical measurement"