Report of the Inter-laboratory Comparison on Manganese and Permanganate Index in Water (2020)

THE SECOND ROUND OF AN INTERNATIONAL STUDY

2020

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Title

Report of the Inter-laboratory Comparison on Manganese and Permanganate Index in Water (2020)

Authors

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Standards

ISO 13528: 2015

Statistical Methods for Use in Proficiency Testing by Interlaboratory Comparison

GB/T 27043-2012

Conformity Assessment-General Requirements for Proficiency Testing

GB/T 28043-2019

Statistical methods for use in proficiency testing by interlaboratory comparison

JJF 1117.1-2012

Measurement Comparison of Chemical Quantity

JJF 1343-2012

General and Statistical Principles for Characterization of Reference Materials

CNAS-GL002: 2018

Guidance on Statistic Treatment of Proficiency Testing Results and Performance Evaluation

CNAS-GL003: 2018

Guidance on Evaluating the Homogeneity and Stability of Samples Used for Proficiency Testing

CNAS-GL032: 2018

Guidance on the Selection, Review and Use of Proficiency Testing

Key words: Inter-laboratory Comparison, Manganese, Permanganate Index, Water

Contents

Summary

The Inter-laboratory Comparison on Manganese and Permanganate Index in Water (2020) was jointly conducted by Water Quality Analysis Laboratory, RCEES, CAS and Centre of Excellence for Water and Environment (CEWE), CAS-TWAS in 2020. And this activity was supported by Certification and Accreditation Administration of People's Republic of China, CNCA.

This study included the determination of manganese and permanganate index in two different water items, which were both distributed to the participating laboratories with two testing samples at the same concentration respectively. The objectives of this proficiency testing were

A. To offer a tool for quality assurance to the participating laboratories.

B. To assess the between laboratory reproducibility.

C. To provide a general overview of the analytical performance of laboratories in the countries along the Belt and Road.

D. To elevate the quality control system of the laboratories in the countries along the Belt and Road.

Thirty-eight testing samples were sent to 26 different laboratories from 12 countries along the Belt and Road, with 15 sets of data returned from 12 laboratories of 9 countries. This report presents the reported results for 10 sets of manganese samples and 5 sets of permanganate index samples. In additional, one set of manganese samples was retested by one laboratory after discussion and application.

The standard value for each analyte in the testing samples were determined by National Institute of Metrology, China. All values exceeding ±50% of the assigned concentrations were removed from the calculation. The consensus mean and the standard deviation (SD) were calculated from the remaining data, while this SD and the consensus mean were used to subsequently calculate z-scores.

For the samples of manganese(-a and -b), z-scores within ±2 were obtained by 70% of the reporting participants (corresponding to 7 of the total 10 participants) . A satisfactory result for the retested samples with an intial problematic result was obtained.

For the samples of permanganate index(-a and -b), z-scores over 3 were obtained by 80% of the reporting participants (corresponding to 4 of the total 5 participants), and the z-score within ±2 and between 2-3 were achieved by the same proportion of 20% of the participants respectively.

Introduction

The analytical laboratories with skills and abilities are required to perform related measurements that are accredited according to ISO standards or some other related standards. Inter-laboratory Comparison is an effective way to improve the quality control system for the analytical laboratories through external measures, which is particularly becoming of increasing importance in the context of globalization of world economy.

This is the second round of the inter-laboratory comparison study on water quality analysis in the countries along the Belt-and-Road, jointly organized by Water Quality Analysis Laboratory and CAS-TWAS Centre of Excellence for Water and Environment (CAS-TWAS CEWE), both of which are affiliated with the Research Center for Eco-environmental Sciences (RCEES), Chinese Academy of Sciences (CAS).

The main objective of the activity is to assess the between laboratory reproducibility on water quality analysis, and to provide a QA/QC tool for each participating laboratory to improve their performance.

This activity took place from August 2020 when the samples were delivered to the laboratories for analysis, and ended in November 2020 for the first phase when all the reports with results were received. A draft report was made available to the participants till on March 2021.

In 2020，the worldwide COVID-19 epidemic brought great challenges to the implementation of this inter-laboratory comparison work. We sincerely appreciate all the participants and individual analysts for overcoming difficulties and providing support actively to this activity.

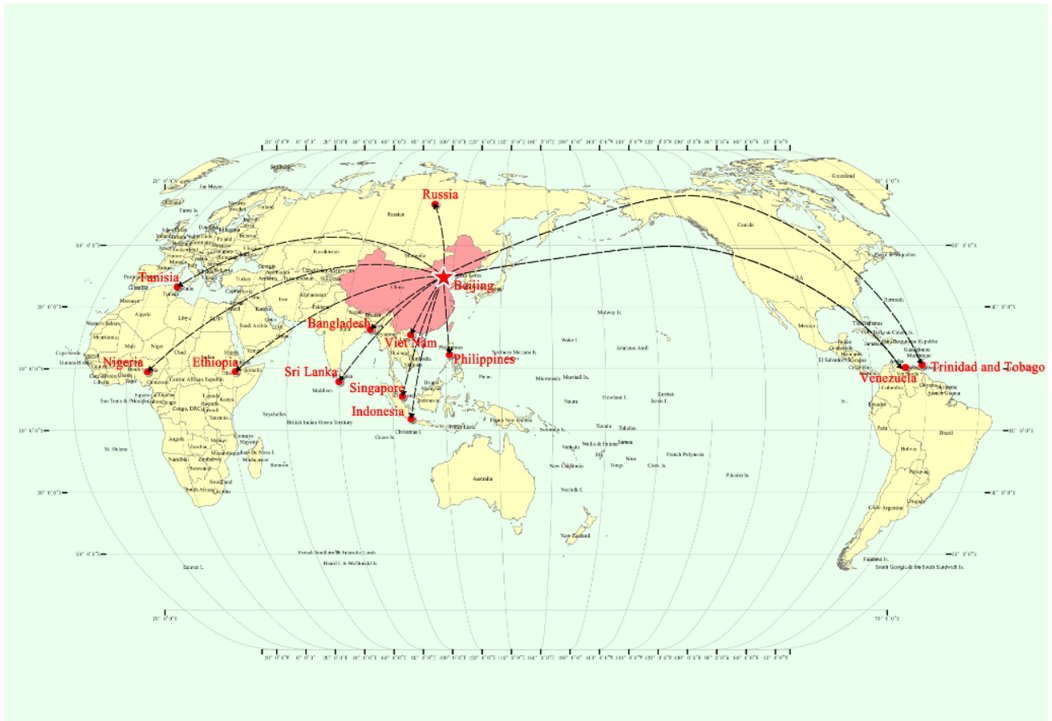


Figure 1 Distribution of the participating laboratories

Table 1. Participants that reported results in the Inter-laboratory Comparison on Manganese and Permanganate Index in Water (2020)

Region	Countries
Asia	Singapore, Sri Lanka, Philippines, Bangladesh
Africa	Ethiopia, Nigeria, Tunisia
South America	Trinidad and Tobago, Venezuela
Total	9 countries (12 laboratories)

Finally, 12 laboratories from 9 countries (presented in Table 1) along the Belt and Road submitted results, and thereby contributed to the study results.

Design and practical implementation

Study design and reporting of results

The analysis should be performed using the laboratories' own methods for instrumental analysis, their own quantification standards and quantification procedures. Table 2 showed the testing method from the participants that reported results.

Table 2. Testing methods from the participants in the Inter-laboratory Comparison on Manganese and Permanganate Index in Water (2020)

Items	Testing Methods	Countries
Manganese	Periodate Spectrophotometry	Ethiopia, Nigeria
	Inductively Coupled Plasma Optical Emission Spectrometer(ICP)	Singapore, Philippines, Sri Lanka, Tunisia
	Atomic Absorption Spectroscopy (AAS)	Ethiopia, Bangladesh, Trinidad and Tobago, Venezuela, Sri Lanka
Permanganate Index	Acid Potassium Permanganate Titration Method	Venezuela, Sri Lanka, Tunisia

The laboratories were to report the concentration of each analyte and the uncertainty according to the Report forms.

Confidentiality

Each participating laboratory was given an exclusion laboratory code by coordinators. In the present report, the participants are presented in the tables and figures by their unique codes. The participants have access to their own code only, and laboratory codes were not revealed to any third parties. Both the testing samples distribution and results are transmitted by code. When received by the coordinators, the raw data from the laboratories were entered into a database for the report draft.

Statistical analysis

According to the distribution frequency of the results, the histogram was drawn. The histogram graph presented a normal distribution, so classical statistical analysis method could be adopted. By removing abnormal data after expert review, the sample mean value ($\bar{x}$) indicated the assigned value, and the standard deviation (s) indicated the standard deviation of ability assessment ($\hat{\sigma}$). The value of "$\bar{x}$" and "s" were calculated according to the equation (1) and (2):

$$\bar{x} = \sum_{i=1}^{p} \frac{x_i}{p} \quad \cdots\cdots (1)$$

$$s = \sqrt{\sum_{i=1}^{p} \frac{(x_i - \bar{x})}{(p-1)}} \quad \cdots\cdots (2)$$

Where p=number of the remaining data; x_i =reported value; $\bar{x}$ =mean of the remaining data; s= standard deviation (SD).

Table 3. Sample mean / Assigned value of Inter-laboratory Comparison on Manganese and Permanganate Index in Water (2020)

Items	Sample mean /Assigned value (mg/L)	Solvent
Manganese	23.9	2%HNO_3
Permanganate Index	107	H_2O

Z-score was adopted to evaluate the results in the inter-laboratory comparison. Z-score was calculated according to the equation (3):

$$z = \frac{x - h}{\hat{\sigma}} \quad \cdots\cdots (3)$$

Where x=reported value; X=$\bar{x}$assigned value; $\hat{\sigma}$ =SD. $|z| \leq 2.0$ means a satisfied result; $2.0 < |z| < 3.0$ means a problematic result; $|z| \geq 3.0$ means an unsatisfied result.

There were three kinds of evaluation results: satisfactory, problematic and unsatisfactory. For each laboratory, only when both samples meet the conditions of "$|z| \leq 2.0$", a satisfied result will be achieved. Otherwise, the result will be evaluated as unsatisfied. Table 4 showed the acceptable detection range of manganese and permanganate index in water.

Table 4. Acceptable range of results in the Inter-laboratory Comparison on Manganese and Permanganate Index in Water (2020)

Items	Assigned value(mg/L)	$\|z\| \leq 2.0$	Minimum Concentration(mg/L)	Maximum Concentration(mg/L)	Lab to Lab Accuracy(%)
Manganese	23.9	Satisfied	21.3	26.5	≤11
Permanganate Index	107	Satisfied	78	136	≤27

The final report and certificate

The final report was drafted by the coordinators and published in March 2021.

A certificate of participation will be sent to each laboratory who has contributed to the results by the end of March 2021.

Coordination

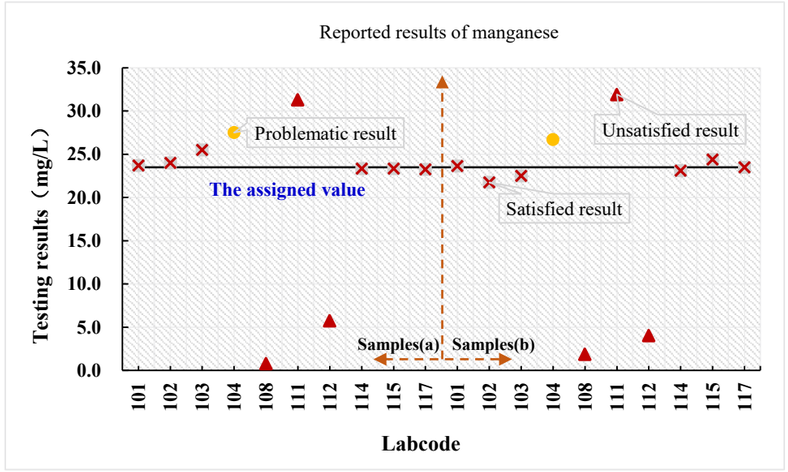
This activity was initiated by CNCA and RCEES, and jointly carried out by the Water Quality Analysis Laboratory and CAS-TWAS Centre of Excellence for Water and Environment (CEWE), RCEES. Members of the coordination committee were:

Dr. Hongyan LI, Senior engineer
Prof. Min YANG, Director
szfxsys@126.com; cas_twas@rcees.ac.cn

Results

Manganese

For the samples of manganese, results from 10 laboratories were received. The assigned value of manganese is 23.9 mg/L, the uncertainties is 1% and SD was 1.31.



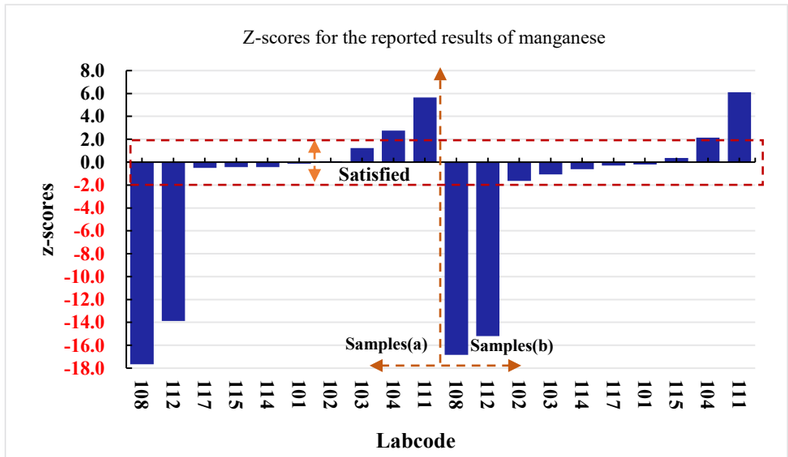


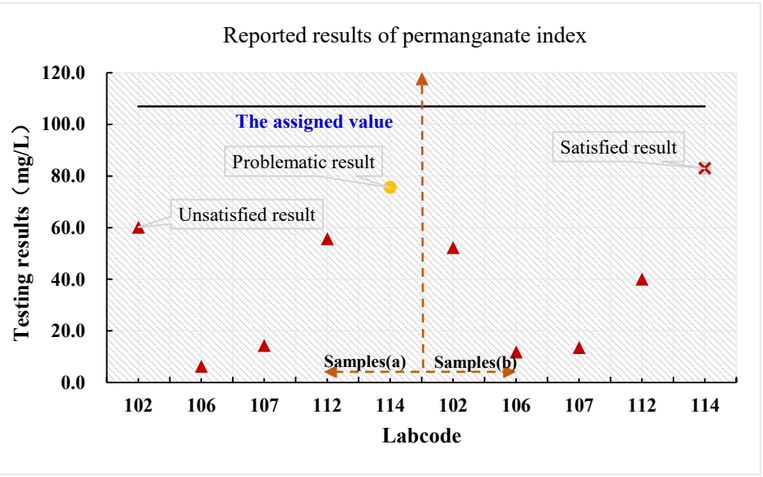
Figure 2 Study results of manganese

Figure 2 showed the study results of manganese. It could be seen that of the 10 participating laboratories, 6 achieved z-scores within ±2 as satisfied results, 3 obtained z-scores over ±3 as unsatisfied results, and 1 laboratory reported both testing results with Z-score of 2-3 as problematic results. Result of each participant were presented in Appendix C1-1.

Because one laboratory with an intial problematic result applied for retesting of manganese samples, their reported results was calculated with the same statistical analysis as above, and then a satisfactory result was obtained(shown in Appendix C1-1).

Permanganate Index

For the samples of permanganate index, results from 4 laboratories were received. The assigned concentration of permanganate index is 107 mg/L, the uncertainties is 1.7% and SD is 14.72.



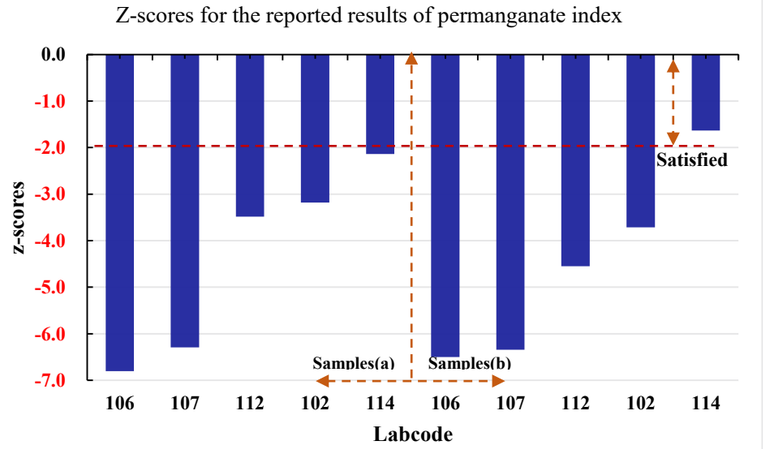


Figure 3 Study results of permanganate index

Figure 3 showed the study results of permanganate index. It could be seen that of the 4 participating laboratories, 4 achieved z-scores over ±3 as unsatisfied results， and one laboratory submitted the testing results with z-score of 2.1 for permanganate index-a as problematic result and z-score of 1.6 for permanganate index -b as satisfied result. Result of each participant were presented in Appendix C1-2.

Technical analysis

These evaluation results of the inter-laboratory comparison are only the digital expression of the analytical ability, while the technical analysis could explain more for the participating laboratories. By analyzing the original records and testing methods, the reasons for the unsatisfactory evaluation results would help to identify the potential risk of data and improve the ability of laboratories. In this study, a method for the testing inaccuracy risk evaluation was established by the z-score of intra-laboratory (ZW), which could classify the low, medium and high risk levels with data inaccuracy. Technical analysis includes risk identification of data and technical traceability (including original records and testing methods), and technical recommendations based on the technical analysis.

Risk identification and screening of original records

The z-score of intra-laboratory (ZW) in the "Guidance on Statistic Treatment of Proficiency Testing Results and Performance Evaluation CNAS-GL002:2018" was introduced to evaluate the risk of all returned results. The calculation of ZW in the laboratory is shown in the equation (4) and (5).

The results were obtained from samples A and B, the standardization difference(D) was calculated according to the equation (4):

$$D = \frac{(A-B)}{\sqrt{2}} \text{(retain ± of D)} \cdots\cdots (4)$$

By calculating the standardization difference of each participant's result pair, the med(D) and NIQR(D) can be obtained, ZW was calculated according to the equation (5):

$$ZW = \frac{D-med\ (D)}{NIQR\ (D)} \text{(retain ± of D)} \cdots\cdots (5)$$

Where *A,B*= sample result pair; *D*= standardization difference; *med(D)*= the median value of D; *NIQR(D)*=norm IQR(D)
|ZW|≤2.0 means low risk of inaccuracy; |ZW|>2.0 means moderate risk of inaccuracy; |ZW|≥3.0 means high risk of inaccuracy, or the results are not even inaccurate.

ZW of Manganese

Figure 4 showed the data security risk identification status of 10 laboratories that fed back the results of manganese. Three of the laboratories (Lab 102、Lab 103、Lab 115) with satisfactory results were at high risk of inaccuracy. Through the technical traceability of all the original records, it was found that the original record information was incomplete and the valuable information provided was insufficient. In addition, among the unsatisfied laboratories, only one laboratory (Lab115), which had results in the high risk of inaccuracy, provided partial original records. After technical traceability, it was found that the laboratory reported the wrong results.

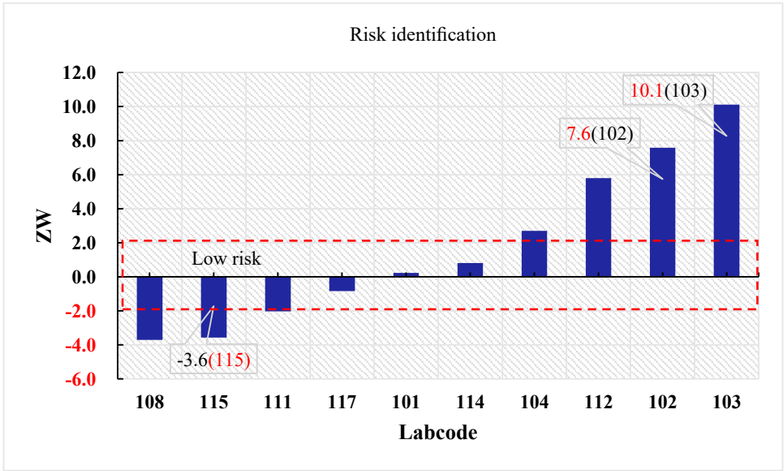


Figure 4 Study results (ZW) of manganese

ZW of Permanganate Index

Figure 5 showed the data security risk identification status of 5 laboratories that fed back the results of permanganate index. Four of the laboratories with unsatisfactory results were at low risk of inaccuracy. "Low risk" did not mean the result was risk-free. Unfortunately, none of the 5 laboratories has provided original records, so it is difficult to make technical traceability only according to the result report or test results.

Although one of the laboratories mentioned in the email that the laboratory conditions and environment were limited due to the epidemic situation, and the pH of deionized water used in the experiment was 6.5, this did not contribute much to the technical traceback.

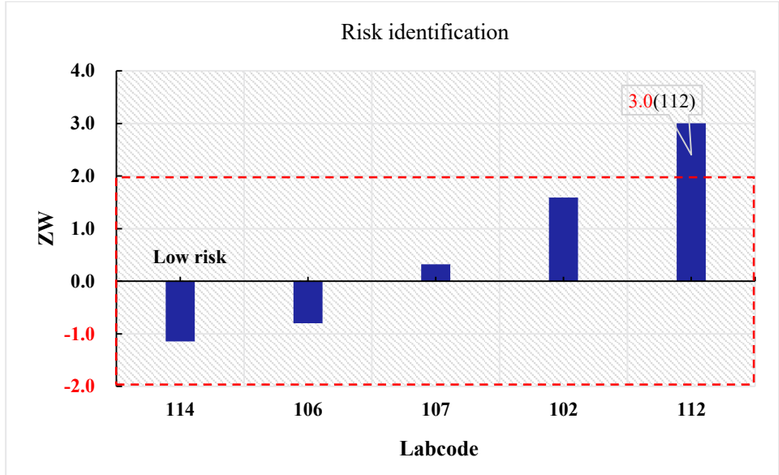


Figure 5 Study results (ZW) of permanganate index

Analysis of the testing methods

The limit of detection, reproducibility and recovery of the method were important parameters to evaluate whether the method was suitable for sample testing. Based on the technical traceability of original records, the testing methods of all laboratories and the key technical parameters of each method were summarized in Table 5 and analyzed in Figure 6.

For the manganese testing, both methods of flame atomic absorption spectrometry (AAS) and inductively coupled plasma spectrometry (ICP) were suitable for the testing samples, but the ICP method had higher precision and accuracy. Periodate oxidation spectrophotometry (portable reagent kit) was a method for rapid on-site detection and not recommended for high-precision data analysis.

For the determination of permanganate index, all laboratories used the titration method in the standard of "Water quality - Determination of permanganate index (ISO 8467:1993)", and the detection limit and reproducibility were shown in Table 5.Those laboratories with unsatisfied results are recommended to improve the analysis ability of permanganate index from the procedures of blank treatment, water bath process and identification of the titration end.

Table 5. Testing methods from the participants in the Inter-laboratory Comparison on Manganese and Permanganate Index in Water (2020)

Items	Testing Methods	Standards	Detection limit(mg/L)	Reproducibility%	Recovery%
Manganese	AAS	GB 11911-1989 (China)	0.01	0.6	94.9-106
		GB/T 5750.6-2006 3.1(China)	0.01	7.9	90.0-105
	ICP	GB/T 5750.6-2006 3.5(China)	0.0005	0.4-1.6	94.1-95.9
	Periodate spectrophotometry	EPA 8034	0.1	/	/
Permanganate Index	Acid potassium permanganate titration method	ISO 8467:1993	0.5	0.05-0.6	/

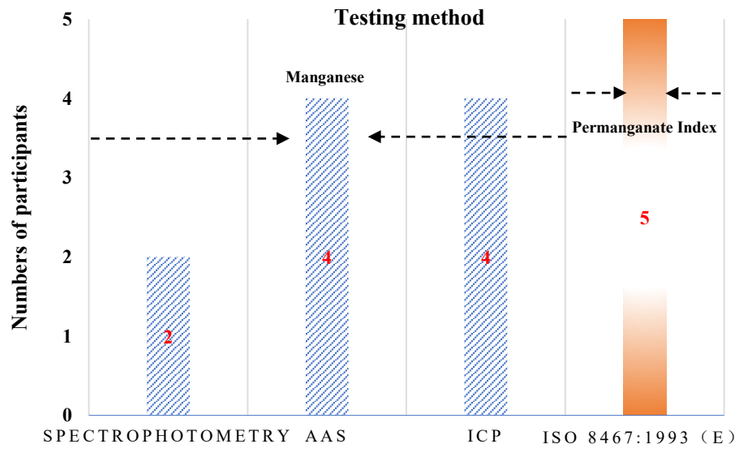


Figure 6 Statistics of testing methods in the inter-laboratories comparison on manganese and permanganate index in water (2020)

Acknowledgement

The laboratories are acknowledged for their participation in this inter-laboratory comparison and in their interest in its overall objectives.All the individual analysts are acknowledged for their contributions to the results.

Thanks support from Certification and Accreditation Administration (Grant No.[2020]24) and support from the Alliance of International Science Organizations(Grant No.ANSO-CR-KP-2020-05); Thanks Prof. Xiaohong WAN from the Water Environment Monitoring Assessment and Research Center, Ministry of Water Resources, China, and Prof. Jingbo CHAO from the National Institute of Metrology, China for providing the standard solutions for their technical guidance during the implementation of this inter-laboratory comparison.

Appendix A1-1 Operation Instruction

“Manganese in water” Operation Instruction

Participating laboratories:

The Inter-laboratory Comparison on Manganese and Permanganate Index in Water 2020 is organized and implemented by the CAS-TWAS Center of Excellence for Water and Environment Research Center for Eco-environmental Sciences Chinese Academy of Sciences. In this project, your laboratory code is **124**. The relevant information of the project is as follows:

To ensure the smooth implementation of the capacity verification, please read the following instructions carefully before testing:

1.Test sample description

1.1 This operation instruction is for the determination of **manganese in water**, and the assessment samples will be provided randomly according to the registration information.

1.2 Two samples provided for this test are packaged in ampoules with volume about 20 mL, numbered **M124a** and **M124b**. The matrix is 2% HNO_3. The reference concentration of the manganese in samples is between 2.50 mg/L~37.50 mg/L (before the dilution).

1.3 The samples will be delivered from CAS-TWAS Center of Excellence for Water and Environment Research Center for Eco-environmental Sciences Chinese Academy of Sciences.

1.4 Upon receipt, please confirm that the sample is in good condition. Please fill in the **Sample Receiving Status Confirmation Form** within 7 days after receipt and send the scanned copy of the form to **szfxsys@126.com**. If the sample received is damaged, please contact with **szfxsys@126.com** in time and apply for replacement (Note: The replacement is only for damage caused by transportation, but not that caused by experimental operations).

1.5 Store in dark with room temperature, and test as soon as possible.

2. Test description

2.1 Dilution method: Use a clean and dry pipette to accurately remove 10 mL of the sample from the ampoule, transfer it to a 250 mL volumetric flask, dilute to volume with ultrapure water or as required by the test method, and test immediately after mixing. Each sample must be tested in duplicate.

2.2 The actual testing methods of each laboratory should be consistent with that in the registration form. If there is any change, instructions for the change should be submitted and the registration form should be resubmitted.

3. Result report

3.1 The results of "**Manganese in water**" should be reported in mg/L with **the concentration before dilution** in the **《Capability Verification Results Report Form》**. At the same time, the average results should be calculated and retained 3-digit valid numbers. If the laboratory can evaluate the uncertainty of the results, please give the extended uncertainty (U) (k=2) in the report.

3.2 Each laboratory should send the **《Capability Verification Results Report Form》** and the detailed original records to **cas_twas@rcees.ac.cn** within 30 natural days (including weekends and national holidays) since the receipt of the samples. It will not be count and evaluated if the results are not sent in time.

3.3 During the implementation of this proficiency testing program, each laboratory should pay attention to confidentiality, independently complete the experiment and submit the report.

Note: The original records should include quality control samples, standard samples, parallel samples and other quality control measures. Quality control measures should reflect the reliability of test results.

4.Contact information

If you have any question during the competency verification process, please contact with CAS-TWAS Center of Excellence for Water and Environment Research Center for Eco-environmental Sciences Chinese Academy of Sciences.

Contact: Si, Ludan
Contact number: +86-10-62849800
E-mail: cas_twas@rcees.ac.cn
Contact address: CAS-TWAS Center of Excellence for Water and Environment Research Center for Eco-environmental Sciences Chinese Academy of Sciences, Beijing 100085, CHINA

“Permanganate index in water” Operation Instruction

Participating laboratories:

The Inter-laboratory Comparison on Manganese and Permanganate Index in Water 2020 is organized and implemented by the CAS-TWAS Center of Excellence for Water and Environment Research Center for Eco-environmental Sciences Chinese Academy of Sciences. In this project, your laboratory code is **124**. The relevant information of the project is as follows:

To ensure the smooth implementation of the capacity verification, please read the following instructions carefully before testing:

1.Test sample description

1.1 This operation instruction is for the determination of **permanganate index in water**, and the assessment samples will be provided randomly according to the registration information.

1.2 Two samples provided for this test are packaged in ampoules with volume about 20 mL, numbered **P124a** and **P124b**. The matrix is water. The reference concentration of the permanganate index in samples is between 50.00 mg/L~250.00 mg/L (before the dilution).

1.3 The samples will be delivered from CAS-TWAS Center of Excellence for Water and Environment Research Center for Eco-environmental Sciences Chinese Academy of Sciences.

1.4 Upon receipt, please confirm that the sample is in good condition. Please fill in the **Sample Receiving Status Confirmation Form** within 7 days after receipt and send the scanned copy of the form to **szfxsys@126.com**. If the sample received is damaged, please contact with **szfxsys@126.com** in time and apply for replacement (Note: The replacement is only for damage caused by transportation, but not that caused by experimental operations).

1.5 Store in dark with room temperature, and test as soon as possible.

2.Test description

2.1 Dilution method: Use a clean and dry pipette to accurately remove 10 mL of the sample from the ampoule, transfer it to a 500 mL volumetric flask, dilute to volume with ultrapure water or as required by the test method, and test immediately after mixing. Each sample must be tested in duplicate.

2.2 The actual testing methods of each laboratory should be consistent with that in the registration form. If there is any change, instructions for the change should be submitted and the registration form should be resubmitted.

3.Result report

3.1 The results of " **Permanganate index in water**" should be reported in mg/L with **the concentration before dilution** in the **《Capability Verification Results Report Form》**. At the same time, the average results should be calculated and retained 3-digit valid numbers. If the laboratory can evaluate the uncertainty of the results, please give the extended uncertainty (U) (k=2) in the report.

3.2 Each laboratory should send the **《Capability Verification Results Report Form》** and the detailed original records to **cas_twas@rcees.ac.cn** within 30 natural days (including weekends and national holidays) since the receipt of the samples. It will not be count and evaluated if the results are not sent in time.

3.3 During the implementation of this proficiency testing program, each laboratory should pay attention to confidentiality, independently complete the experiment and submit the report.

Note: The original records should include quality control samples, standard samples, parallel samples and other quality control measures. Quality control measures should reflect the reliability of test results.

4.Contact information

If you have any question during the competency verification process, please contact with CAS-TWAS Center of Excellence for Water and Environment Research Center for Eco-environmental Sciences Chinese Academy of Sciences.

Contact: Si, Ludan
Contact number: +86-10-62849800
E-mail: cas_twas@rcees.ac.cn
Contact address: CAS-TWAS Center of Excellence for Water and Environment Research Center for Eco-environmental Sciences Chinese Academy of Sciences, Beijing 100085, CHINA

Appendix A1-2 Sample Receiving Status Confirmation Form

Sample Receiving Status Confirmation Form

Laboratory Name		
Laboratory Code		
Accepted Date		
Accepted Sample	Sample Amount	☐ 2 ☐ 4
	Sample Number	
	Sample Status	☐ in good condition ☐ broken Note: If the samples are broken, please attach sample photos when returning this form.
Recipient	Name	
	E-Mail	

AppendixA1-3 Capability Verification Results Report Form

Capability Verification Results Report Form

"Manganese in water" sample test results report

Laboratory name: _____ Laboratory code:_____

Report date: _____

Sample number	Test results (mg/L)			Extended uncertainty (k=2)	Name and number of the test method	Ambient temperature	Instrument name and model	Date of inspection	Inspector signature	Signature of the certifier
	1	2	Average							

Problems or anomalies that occur during the experiment: _____

_____ (Not enough, please attach a page)

Person in charge (signature):

Official seal:

Capability Verification Results Report Form

"Permanganate index in water" sample test results report

Laboratory name: _____ Laboratory code:_____

Report date: _____

Sample number	Test results (mg/L)			Extended uncertainty (k=2)	Name and number of the test method	Ambient temperature	Instrument name and model	Date of inspection	Inspector signature	Signature of the certifier
	1	2	Average							

Problems or anomalies that occur during the experiment: _____

_____ (Not enough, please attach a page)

Person in charge (signature):

Official seal:

Appendix B Document from CNCA

国家认证认可监督管理委员会

认秘函〔2020〕24 号

认监委秘书处关于开展食品、水质、矿产检验检测能力验证活动的通知

中国检验检疫科学研究院测试评价中心、中国科学院生态环境研究中心、北京中实国金国际实验室能力验证研究中心、各有关检验检测机构:

为贯彻落实党中央、国务院关于做好“六稳”工作、落实“六保”任务的决策部署，保障粮食安全和外贸产业链通畅运转，充分发挥检验检测对“一带一路”建设的技术支撑作用，经研究，决定在食品、水质和矿产检验检测领域组织开展能力验证活动，组织国内外相关检验检测机构共同参与，推动检验检测数据、结果的采信和互认，促进与相关国家在检验检测领域开展更大范围、更深层次的务实合作。现将有关事项通知如下:

一、能力验证项目和参加要求

本次能力验证活动，委托中国检验检疫科学研究院测试评价中心承担“鸡肉中硝基呋喃类兽药残留定量分析”项目实施，委托中国科学院生态环境研究中心承担“水中锰和高锰酸盐指数检测”项目实施，委托北京中实国金国际实验室能力验证研究中心承担“铜精矿中铜、硫、金、银的测定”项目实施。

取得国家认监委颁发的资质认定证书，且具备相关检测项目技术能力的国家产品质检中心应当报名参加相关能力验证项目；因故不能参加的，须向项目承担单位提交书面情况说明。国家认监委将从国内报名单位中选取部分检验检测机构参与本次能力验证活动。

项目承担单位负责联系和邀请“一带一路”沿线国家和其他国家的检验检测机构参加本次能力验证活动。

二、检测标准和样品信息

“鸡肉中硝基呋喃类兽药残留定量分析”可采用 GB/T 21311-2007《动物源性食品中硝基呋喃类药物代谢物残留量检测方法 高效液相色谱/串联质谱法》、SN/T 3380-2012 《出口动物源食品中硝基呋喃代谢物残留量的测定 酶联免疫吸附法》、DB34/T 1838-2013《动物源性组织中硝基呋喃类药物代谢物残留量检测方法 高效液相色谱荧光法》等标准方法或实验室内部方法。测试样品为鸡肉冻干粉，满足常温运输要求，样品规格 10 克/包，每个检验检测机构发放 1 种规格 1 包样品。

“水中锰和高锰酸盐指数检测”可采用 ISO 8467:1993《Water quality - Determination of permanganate index》， GB/T 5750.7-2006《生活饮用水标准检验方法 有机物综合指标》，ISO 6333-1986 《Water quality - Determination of manganese- Formaldoxime spectrometric method》， GB/T 5750.6-2006《生活饮用水标准检验方法 金属指标》等标准方法。测试样品为水溶液，

洁净安瓿瓶包装，样品规格 20 毫升/瓶，每个检验检测机构发放 1 个浓度水平样品 2 瓶。

“铜精矿中铜、硫、金、银的测定”可采用 GB/T3884 系列铜精矿化学分析方法，ISO 10258:2018《Copper sulfide concentrates — Determination of copper content — Titrimetric methods》，ISO10378:2016 《Copper, lead and zinc sulfide concentrates — Determination of gold and silver — Fire assay gravimetric and flame atomic absorption spectrometric method》等标准方法。测试样品为 2 种规格的铜精矿样品，用玻璃瓶包装，60 克/瓶，每个检验检测机构发放 1 种规格 1 瓶样品。

三、时间安排

（一）机构报名：2020 年 7 月—8 月；

（二）样品发放：2020 年 10 月前；

（三）检测结果反馈：2020 年 10 月底前；

（四）初步技术分析报告：2020 年 11 月底前；

（五）结果发布：2020 年 12 月底前。

四、其他事宜

（一）本次能力验证活动不收取费用。

（二）报名参加的检验检测机构应填写报名表（见附件），通过发送电子邮件方式进行报名。

（三）联系方式

1.“鸡肉中硝基呋喃类兽药残留定量分析”能力验证项目

中国检验检疫科学研究院测试评价中心

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地址：北京市亦庄经济技术开发区荣华南路 11 号，100176

2.“水中锰和高锰酸盐指数检测”能力验证项目

中国科学院生态环境研究中心

李红岩，郑蓓：+86+010-62849135，szfxsys@126.com

地址：北京市海淀区双清路 18 号，100085

3.“铜精矿中铜、硫、金、银的测定”能力验证项目

朱生慧：+86+010-62185713，zsh@analysis.org.cn

唐凌天：+86+010-62182652，tanglt@analysis.org.cn

地址：北京市海淀区高梁桥斜街 13 号新材料大楼十层

附件：1. 鸡肉中硝基呋喃类兽药残留定量分析能力验证报名表

2. 水中锰和高锰酸盐指数检测能力验证报名表

3. 铜精矿中铜、硫、金、银的测定能力验证报名表

国家认证认可监督管理委员会 秘书处

认监委秘书处

2020 年 7 月 14 日

（此件不公开）

Appendix C1-1 Presentation of results for manganese

Lab code	Item	comprehensive assessment Conclusion	Testing method	Sample code	Conc 1 (mg/L)	Conc 2 (mg/L)	Mean values (mg/L)	z-score	Conclusion	Sample code	Conc 1 (mg/L)	Conc 2 (mg/L)	Mean values (mg/L)	z-score	Conclusion
101	Manganese	satisfied	AAS	M101a	27.713	23.718	23.715	-0.1	satisfied	M101b	23.659	23.634	23.646	-0.2	satisfied
102		satisfied		M102a	/	/	24.00	0.1	satisfied	M102b	/	/	21.75	-1.6	satisfied
103		satisfied	Periodate spectrophotometry	M103a	25	26	25.5	1.2	satisfied	M103b	23	22	22.5	-1.1	satisfied
104		problematic	ICP	M104a	27.3	27.8	27.5	2.7*	problematic	M104b	26.5	26.9	26.7	2.1*	problematic
104-1		satisfied	ICP	M104a	24.36	23.94	24.2	**0.2**	satisfied	M104b	23.75	24.04	23.9	**0.0**	satisfied
108		unsatisfied	Periodate spectrophotometry	M108a	0.8	0.7	0.75	-17.7§	unsatisfied	M108b	1.8	1.9	1.85	-16.8§	unsatisfied
111		unsatisfied	ICP	M111a	30.53	32.11	31.3	5.6§	unsatisfied	M111b	31.8	31.93	31.9	6.1§	unsatisfied
112		unsatisfied	AAS	M112a	5.75	5.70	5.72	-13.9§	unsatisfied	M112b	3.90	4.10	4.00	-15.2§	unsatisfied
114		satisfied	ICP	M114a	23.565	23.117	23.341	-0.4	satisfied	M114b	23.319	22.88	23.0995	-0.6	satisfied
115		satisfied	AAS	M115a	23.61	23.05	23.33	-0.4	satisfied	M115b	23.75	25.03	24.39	0.4	satisfied
117		satisfied	ICP	M117a	23.00	23.50	23.25	-0.5	satisfied	M117b	23.00	24.00	23.50	-0.3	satisfied
Notes	Manganese Testing: assigned vale =23.9, standard deviation =1.31. $\|Z\| \leq 2.0$ means a satisfied result; $2.0 < \|Z\| < 3.0$ means a problematic result, which is marked with * in the table; $\|Z\| \geq 3.0$ means an unsatisfied result, which is marked with § in the table. 104-1: Retested data							*The evaluation is "unsatisfactory", when any results in the two samples get a $\|z\|>2.0$.							

Appendix C 1-2 Presentation of results for Permanganate Index

Lab code	Item	comprehensive assessment Conclusion	Testing method	Sample code	Conc 1 (mg/L)	Conc 2 (mg/L)	Mean values (mg/L)	z-score	Conclusion	Sample code	Conc 1 (mg/L)	Conc 2 (mg/L)	Mean values (mg/L)	z-score	Conclusion
102	Permanganate Index	unsatisfied	Acid potassium permanganate titration method	P102a	/	/	60.15	-3.2§	unsatisfied	P102b	/	/	52.30	-3.7§	unsatisfied
106		unsatisfied		P106a	6.3	6.3	6.3	**-6.8§**	unsatisfied	P106b	11.8	11.8	11.8	**-6.5§**	unsatisfied
107		unsatisfied		P107a	/	/	14.4	-6.3§	unsatisfied	P107b	/	/	13.6	-6.3§	unsatisfied
112		unsatisfied		P112a	56.0	55.5	55.75	-3.5§	unsatisfied	P112b	40.0	40.1	40.05	-4.5§	unsatisfied
114		problematic		P114a	75.376	75.76	75.568	-2.1*	problematic	P114b	81.776	84.08	82.928	-1.6	satisfied
Notes	Permanganate Index Testing: assigned vale =107, standard deviation =14.72. $\|Z\| \leq 2.0$ means a satisfied result; $2.0 < \|Z\| < 3.0$ means a problematic result, which is marked with * in the table; $\|Z\| \geq 3.0$ means an unsatisfied result, which is marked with § in the table.							*The evaluation is "unsatisfactory", when any results in the two samples get a $\|z\|>2.0$.							