Report from the CCQM Inorganic Analysis Working Group for the period (April 2025 – March 2026)

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Introduction

The IAWG has made excellent progress in its work over the past year, completing some comparisons, making progress on others, and starting new ones. The use of the Decision Tree (DT, but often abbreviated NDT for NIST Decision Tree, because this methodology and software application were developed at NIST; https://decisiontree.nist.gov/) for estimating KCRVs and uncertainties, and degree of equivalence (DoE) and uncertainties, is now firmly entrenched. The IAWG has started a task group to clarify guidance and develop tools for making and judging CMC claims. And the working group also continues to push the boundaries of inorganic chemical analysis into better demonstrated SI-traceability and new and improved metrology for the future.

Meetings

Since the 2025 IAWG annual report, the IAWG has held two meetings. The first was the Spring 2025 meeting held at the BIPM on 08-09 April 2025 as part of CCQM Week. It was fully hybrid, with 85 registered participants (35 in person and 50 online). Also, during these two days, a joint working group meeting was conducted with the SAWG, due to common interest in particle metrology. The total registered attendance for the joint IAWG/SAWG meeting was 95 (38 in person and 57 online). The Fall 2025 IAWG meeting was held virtually over three days (04-06 November 2025), with a total of 84 persons from 40 institutes registered.

Beginning this year, the IAWG plans to hold its Fall meetings in person again as much as possible, as we did before the Covid19 pandemic. Unlike those earlier meetings, however, good quality hybrid capability is now expected for all such meetings. At the kind invitation of the PTB, the IAWG will be meeting in Braunschweig, Germany, 03-05 November 2026.

IAWG Task Group on CMC Guidance

At the April 2025 meeting, the IAWG officially formed an internal Task Group on CMC Guidance. Comprising ten IAWG members from around the world and convened by the IAWG Chair, the TG has met ten times in the past 12 months. The objectives of the TG are to provide the IAWG with better tools and guidance on making and judging CMC claims, especially broad-scope claims.

During the year, the TG has focused most of its attention on developing an electronic record card to assist IAWG institutes when they make their CMC claims. The institute performance record provided by the record card should also assist CMC reviewers. The record card is an Excel workbook that, when fully developed, will contain all measured values and related equivalence statistics for all IAWG institutes in all key and supplementary comparisons, as well as twelve pilot studies, that have been approved to support CMC claims over the three decades of the working group. This includes thousands of numbers, as well as metadata

about measurement technique and calibration approach and other details, drawn from 116 comparisons in total. To avoid transcribing all of this by hand, LLMs are being used to extract the various values and information and place them in the appropriate places in the record card. While the extraction work is not finished, the initial set of extracted values and metadata has been validated, enabling the LLM team to now finish the work. The TG expects to have the record card fully functional in time for the next CMC review cycle.

In addition to record card development, the TG has also been working on clear definitions of narrow-scope and broad-scope CMC claims, as well as direct and indirect evidence. The TG is also planning to update several guidance documents in the IAWG website and to provide training materials.

Finally, the IAWG core capability matrix is likely to be revised as a result of this work. We anticipate reducing the number of cells in the matrix. This might make is easier for the IAWG to keep up with its workload of comparisons needed to support its members' CMC claims.

IAWG Key Comparisons and Pilot Studies

The key comparisons and pilot studies in which the IAWG is currently involved are delineated in Table 1. Several points to note:

- CCQM-K187/P240 (Elements in pork) is the 7th IAWG benchmarking comparison. In the IAWG, benchmarking comparisons, which are undertaken every few years, are intended to serve as a way to assess the overall performance of as many institutes as possible. Participation is strongly encouraged. Each benchmarking study is designed for a common and important matrix, with a small number of mandatory measurands in the key comparison; other measurands are optional. For CCQM-K187, the matrix is pork, representing the important food sector, and the mandatory measurands are the mass fractions of Mg and Pb.
- CCQM-K191/P245 (Nonmetallic and metallic impurities in copper) is the latest effort to evaluate and demonstrate SI-traceability at a most basic level. This comparison will assess capabilities to measure elements –especially the important nonmetals – in high-purity copper. This will help to develop and demonstrate further the IAWG's capabilities to assay the purity of high-purity metals that serve as the foundation of metrology traceability to the SI for so much of inorganic chemical metrology.
- CCQM-K195/P252 (Arsenic speciation in foods) is a new contribution to the important area of food safety. The forms of arsenic found in foods vary dramatically in toxicity. Therefore, being able to measure not just total arsenic, but arsenic species, is critical.
- CCQM-K197/P254 (Preparation of arsenic calibration solutions) follows on the success of CCQM-K143/P181 (Preparation of copper calibration solutions) to demonstrate basic establishment of SI-traceability for inorganic chemical analysis. Arsenic is a somewhat more problematic element than copper for preparing calibration solutions, thereby challenging the IAWG a bit more. We expect the participants to perform well.
- CCQM-K202/P258 (Elements in metal alloy) will help support many existing CMC claims that have not had recent support, as well as enable new claims.
- CCQM-265a (Solid sampling of glass using laser ablation ICP-MS) and CCQM-265b (Solid sampling of gelatin using laser ablation ICP-MS) represent the first attempts of

the IAWG to understand the state of the measurement science in laser ablation sampling of solids. This is an area the IAWG has wanted to explore for years.

Advancing Measurement Science in the IAWG

Particle Metrology

The IAWG continues to have a strong interest in particle metrology, arising primarily from the development and use of single particle (sp)ICP-MS for measuring metal-containing (and in some cases, carbon-containing) particles in liquid suspension. Because such particles are often measured using techniques in which the SAWG has extensive expertise, this is a natural area for cross-WG cooperation. This is more recently also the case with respect to the CAWG and the NAWG, due to their interest in biological particles and surrogates for such particles.

Following on the 2022 CCQM Workshop on Particle Metrology (https://www.bipm.org/en/committees/cc/ccqm/wg/ccqm-ws/2022-10-25), a joint IAWG/SAWG Task Group on Particle Metrology was formed. This TG has now completed its work, and the final report is about to be published. Several areas of work in particle metrology for the IAWG are given, providing direction for future endeavours in this growing metrological field.

Improving SI-traceability for Elemental Analysis

As in past annual reports, it is noted again that the IAWG considers developing and demonstrating capabilities for establishing SI-traceability through primary methods and high-purity, well assayed, materials to be among its most important activities. While for practical purposes, SI-traceability is attainable for inorganic analysis, more stringent demands for its demonstration and enhancement are arising because of advances in science, technology, and commerce. As a result, the IAWG will continue to work on this problem for years to come.

Five of the comparisons listed in Table 1 speak directly to this issue. CCQM-K191/P245 focuses on measuring nonmetallic and metallic elements in a high-purity solid metal. The nonmetals are important, because they often are the dominant impurities in such materials used for establishing SI-traceability, while also being the contaminants that can be measured perhaps the least well. CCQM-K194/P251 also contributes toward establishing SI-traceability when high-purity compounds are used, since water can be a frequent contaminant. Also, CCQM-K197/P254 constitutes an exploration and demonstration of the capabilities of the participants to produce calibration solutions for arsenic, which is an element of medium difficulty in this regard. Finally, CCQM-P265a/b are the first attempts of the IAWG in understanding and developing our capabilities to perform quantitative analysis using laser ablation. For high-purity materials employed for SI-traceability, heterogeneity on small scales can be important for their use, but this is not discussed very much among practitioners.

Elemental Speciation

CCQM-K195/P252 is the latest instalment in the field of elemental speciation measurement – not a new area, but important nonetheless, because of applications pertaining to the environment, food, and other fields. The IAWG is continuing new developments and the

Table 1. Key comparisons and pilot studies registered by the IAWG for the period (April 2025 – March 2026), including progress made.

CCQM Designation	Title	Track [a]	Model [b]	Status	
				April 2025	March 2026
K144/P182	Trace elements in alumina powder	A	1	K144 Final Report published [c]; P182 report not yet written	K144 completed; P182 report not yet written
K155/P196	Elements and tributyl tin in seawater	A	1	K155 Final Report published [d]; P196 report not yet written	K155 completed; P196 report not yet written
K158/P200	Elements and inorganic As in rice	A	1	K158 Final Report published [d]; P200 report published	Completed
K166/P210 [e]	Nanoparticle number concentration in liquid suspension	C	1	Draft A	Draft A
K169/P220 [f]	Amount content of sodium oxalate	A	1	Draft A	Draft B
K178/P223 [g]	Rare earth elements, uranium, and thorium in soil	A	1	Draft A	Draft A
K187/P240 [h]	Elements in pork	A	1	Measurements in progress	Draft A
K188/P241	Elements in particulate matter	A	1	Planning	Registering participants
K191/P245	Nonmetallic and metallic impurities in copper	A	1	Planning	Registering participants
K194/P251	Water mass fraction measurements in hydrated crystalline materials	C	1	Planning	Measurements completed
K195/P252	Arsenic speciation in foods	A	1	Planning	Planning
K197/P254	Preparation of arsenic calibration solutions	A	2	Planning	Planning
K202/P258	Elements in metal alloy	A	1	Planning	Planning
P265a	Solid sampling of glass using laser ablation ICP-MS	D	1	Planning	Planning
P265b	Solid sampling of gelatin using laser ablation ICP-MS	D	1	Planning	Planning

[a] "Track A" refers to measurements that constitute core functions performed routinely by the member institutes; "Track C" refers to more specialized measurements that are not commonly used to provide measurement services; "Track D" refers to standalone pilot studies.

[b] "Model 1" means the pilot institute sends samples to the participants to be measured; "Model 2" means the participants send samples to the pilot institute for measurement.

[c] Final Report approved and sent to KCDB office but not uploaded to the KCDB.

[d] Final Report available on the KCDB, but other information tabs (e.g., degrees of equivalence) unavailable.

[e] Registered jointly under both the IAWG and the SAWG.

[f] Registered jointly under both the IAWG and the EAWG.

[g] Participation in P223 is open to the CCRI(II).

[h] 7th IAWG benchmarking comparison.

demonstration of equivalent measurement capabilities among its members. This comparison follows the successful completion of CCQM-P215 [Arsenic speciation in seafood (aquatic animals)].

Laser Ablation Analysis Small Sample and Chemical Imaging Metrology

Expanding support for small sample and chemical imaging metrology is part of the IAWG strategy for 2021-2030 (https://www.bipm.org/documents/20126/57465575/CCQM-IAWG+Strategy+document+2021-2030.pdf/56c8a480-f539-0ea2-b486-7c0fee0e0c1c). The most relevant measurement approach that is in the IAWG purview is laser ablation (LA) sampling, usually with ICP-MS detection. To begin exploring capabilities among its member institutes, the IAWG is pleased that a pair of new pilot studies have now been registered and are in the planning stage. These are CCQM-P265a/b, as shown in Table 1. These pilot studies will probably be followed by other comparisons in the years to come.