****

**2024 ANNUAL REPORT**

**of the COOMET TC 1.8 “Physical Chemistry”**

**1 GENERAL DESCRIPTION OF COOPERATION IN THE SUBJECT FIELD**

Activities of the CООМЕТ Technical Committee 1.8 “Physical Chemistry” cover measurement services related to the field of Metrology in Chemistry and Biology.

**COOMET TC 1.8 Members**

The following 22 NMIs from 17 COOMET member countries are represented in TC 1.8: AzMI (Azerbaijan); CJSC "NBSM" (Armenia); BelGIM (Belarus); BIM (Bulgaria), IMBIH (Bosnia and Herzegovina); PTB and BАМ (Germany); GEOSTM (Georgia); KazStandard (Kazakhstan); CSM (Kyrgyzstan); INIMET (Cuba); INM (Moldova); NIM (China); TUBITAK UME (Turkey); VNIIM, VNIIFTRI, UNIIM – branch of VNIIM, VNIIOFI, VNIIMS (Russia); SMU (Slovakia); Tajikstandart (Tajikistan); UzNIM (Uzbekistan).

In 2024, the main activities of TC 1.8 “Physical Chemistry” were the following:

* Organization and carrying out of works on preparing CMC data of the COOMET member countries' NMIs – signatories to the CIPM MRA,
* Organization and carrying out internal review of CMCs of COOMET NMIs, as well as interregional CMC review of institutes from other RMOs,
* Planning and organization of international comparisons and interlaboratory research,
* Familiarizing of TC 1.8 members with CCQM and COOMET documents aimed at implementing the CIPM MRA provisions and ensuring the traceability of measurement results,
* Improvement of the TC 1.8 structure, and
* Provision of metrological services in the field of physical and chemical measurements.

**2 TC 1.8 PROJECTS**

The COOMET NMIs with sufficient standard instruments, as well as interested metrological centers and designated laboratories of other countries take part in the TC projects related to international comparisons and pilot studies. At present, the TC’s projects are coordinated by VNIIM, UNIIM – branch of VNIIM, and VNIIOFI.

**VNIIM coordinates the following projects:**

* COOMET Project 864/RU/22: Key comparison “Motor vehicle emissions”. Participants: VNIIM, BelGIM, KazStandart. Draft A in progress.
* COOMET Project 920/RU/25: Key comparison “Natural gas”. Participants: VNIIM, BelGIM, KazStandart, NIM (China), UzNIM. Sample preparation stage.

**UNIIM – branch of VNIIM coordinates the following projects:**

* COOMET 865/RU/22: Pilot comparison “Mass fraction of carbon and sulfur in steel”. Participants: UNIIM – branch of VNIIM, VNIIOFI, NIM (China). Technical Protocol is ready to be sent to the Participants.
* COOMET 879/RU/23: Pilot comparisons in the field of measuring the nutritional value of chocolate. Participants: UNIIM – branch of VNIIM, BelGIM, NIM (China). Report B is prepared. The topic is completed.
* COOMET 880/RU/23: Pilot comparisons in the field of measuring the nutritional value of milk powder. Participants: UNIIM – branch of VNIIM, Bishkek Center for Testing, Certification and Metrology (Kyrgyzstan), NIM (China). Report B is prepared. The topic is completed.
* COOMET 881/RU/23: Pilot comparisons in the field of measuring the nutritional value of soy flour. Participants: UNIIM – branch of VNIIM, Bishkek Center for Testing, Certification and Metrology (Kyrgyzstan), NIM (China). Report B is prepared. The topic is completed.
* COOMET 894/RU/23: Pilot comparisons in the field of measuring low gas permeability of rocks. Participants: UNIIM – branch of VNIIM, NIM (China), etc. Technical Protocol is ready to be sent to the Participants.
* COOMET 921/RU/25: Pilot comparisons in the field of measuring mass fraction of raw gluten in wheat grain. Participants: UNIIM – branch of VNIIM, NIM (China). The topic is registered, Technical Protocol is being prepared.

**VNIIFTRI coordinates the following projects:**

* COOMET 930/RU/25 Supplementary comparison on determining hydrogen index of phosphate buffer solution pH ~ 6.86. The search for participants for the comparisons is underway.
* COOMET 928/RU/25 Pilot comparison on determining of zeta potential with nominal values of + 90 mV and -90 MB. The search for participants for the comparisons is underway.
* COOMET 927/RU/25 Pilot comparison on determining particle sizes with diameters of 200, 500 and 1000 nm in liquid. The search for participants for the comparisons is underway.
* Pilot comparison “Measuring pH of borate buffer solution (pH ~9.18)” (VNIIFTRI/UzNIM). The search for participants for the comparisons is underway.

**VNIIOFI coordinates the following projects:**

* COOMET Project 806/RU-a/20: Pilot comparison “Mass fraction of aluminum in pure aluminum”. Search for participants is repeated.
* COOMET Project 807/RU-a/20: Pilot comparison “Mass fraction of Mg in pure magnesium”. Search for participants is repeated.
* COOMET Project 808/RU-a/20: Pilot comparison “Mass fraction of Ni in pure nickel”. Search for participants is repeated.
* COOMET Project 809/RU-a/20: Pilot comparison “Mass fraction of Ti in pure titanium”. Search for participants is repeated.

**TC 1.8 PLANNED PROJECTS**

| **Coordinating NMI** | **Project** |
| --- | --- |
| UNIIM – branch of VNIIM | Repeatedly proposed topics:* Pilot comparison “Analysis of lithium carbonate”
* Pilot comparison “Determination of purity of metallic bismuth”
 |
| VNIIM | Pilot comparison “Measuring isotopic ratios of carbon, oxygen, and hydrogen in an organic matrix” |
| NIM | * Pilot comparison on measuring chlorine content in crude oil
* Pilot comparison on measuring sulfur content in coal
 |

**3 RESULTS OF THE LAST TC 1.8 MEETING**

The last meeting of COOMET TC 1.8 "Physical Chemistry" was held on October 29 – 30, 2024 in VNIIFTRI in a hybrid format.

32 representatives of the following NMIs attended the meeting: BelGIM (Belarus), KazStandard (Kazakhstan), NIM (China), UzNIM (Uzbekistan), NIM (Moldova), VNIIM, UNIIM — branch of VNIIM, VNIIOFI, VNIIFTRI, VNIIMS (Russia), Tadjikstandart, as well as the COOMET Secretariat.

The following reports were made:

* on decisions of the COOMET Committee and COOMET Presidential Council,
* on decisions of the 26th and 27th meetings of the COOMET Joint Committee on Measuring Standards (JCMS), issues related to the decision taken at the 113th meeting of the CIPM and 47th meeting of JCRB were discussed, as well as the results of the Forum on Digitalization,
* information from the TC 1.8 representatives – members of the CCQM WGs on participation in the activities of the Consultative Committee and its Working Groups and its strategy, and
* reports from the TC 1.8 Members (BelGIM, KazStandard, NIM (China), UzNIM, NIM (Moldova), VNIIM, UNIIM, VNIIOFI, VNIIFTRI, VNIIMS, Tadjikstandart) on the state of affairs in their NMIs.

**4 NEW AND PLANNED DEVELOPMENTS OF COOMET NMIs**

* VNIIM developed the State Primary Measurement Standard of unit of DNA Copy Number (GET 220-2024),
* The State Primary Reference Technique for measuring mass fraction of fat in food products and food raw materials was developed in UNIIM – branch of VNIIM,
* The following State Reference Data (GSSDs) was developed and certified in VNIIMS:
* GSSD 452-2024 “Molar extinction coefficient of proteins, antibodies, nucleotides, oligonucleotides, nucleic acids, DNA, RNA, and pigments (chlorophyll)”,
* GSSD 453-2024 “Nucleic acid nucleotide sequences. Deoxyribonucleic acid (DNA) – nuclear, mitochondrial; ribonucleic acid (RNA), including pathogenic biological agents (PBAs)”,
* GSSD 457-2024 “Mass spectra of antihistamines. Hydroxyzine, diphenylhydramine, ketotifen, promethazine, pheniramine, chloropyramine, chlorpheniramine”,
* VNIIMS developed a CRM of composition of human genomic DNA E701 (GSO 12688-2024),
* Within the national project “Sovereignty”, in 2024, NMIs of the Russian Federation (VNIIM, VNIIMS, VNIIFTRI, VNIIOFI, UNIIM – a branch of VNIIM) developed 55 new CRMs and 20 types of measures in the following field of quality control of food products, pharmaceuticals, isotopic composition of carbon and oxygen in the air and in gas mixtures, composition of metal and anion solutions, composition of gas mixtures, composition of organic solutions, the unit of electrolytic conductivity, size and number of particles in an aqueous matrix, optical properties,
* BelGIM updated its reference gas equipment – the gas mixture generator GGS-UR (Russia) was introduced to the set-up, designed to reproduce the unit of volume (molar) fraction and/or mass concentration of measurands (chemically active, sulfur-containing and hydrocarbon gases) in binary and multicomponent gas mixtures,
* Within the framework of the agreement between the Government of the Russian Federation and the Government of the Republic of Uzbekistan on technical support in the field of metrology, UzNIM plans to develop the State Measurement Standard of unit of molar fraction of natural gas components in gas mixtures (2026),
* KazStandart has begun works on expanding the functionality of the State Measurement Standard by incorporating a new gas analysis complex based on IR, UV, paramagnetic measurement methods, as well as on gas chromatography to analyse sulfur-containing mixtures in gas mixtures.

**5 COOPERATION WITH INTERNATIONAL AND REGIONAL ORGANIZATIONS**

TC 1.8 representatives are involved in the CCQM activities almost since its founding, and participate in work of the following working groups: WG on Key Comparisons (CCQM-KCWG); WG on Organic Analysis (CCQM-QAWG); WG on Gas Analysis (CCQM-GAWG); WG on Inorganic Analysis (CCQM-IAWG); WG on Bio Analysis (CCQM-BAWG), WG on Electrochemical Analysis (CCQM-EAWG); WG on Cell Analysis (CCQM-CAWG); WG on Nucleic Acid Analysis (CCQM-NAWG); WG on protein Analysis (CCQM-PAWG); WG on Surface Analysis (CCQM-SAWG); and WG on Isotope Analysis (CCQM-IRWG).

**APMP**

VNIIM (Russia) has been the APMP Full Member since 2008, and KazStandard (Kazakhstan) and UzNIM (Uzbekistan) are Associate Members. On November 21 – 26, 2024, in NPLI, India, representatives of the COOMET NMIs participated in the APMP General Assembly, meetings of the Technical Committee on Metrology in Chemistry and Biology (TCQM) and Technical Committee on Metrology of Materials (TCMM), as well as in the meetings of the Focus Groups on Energy Efficiency (EEFC), Clean Water (CWFG), Food Safety (FSFG), and Metrology In Medicine (MMFG). A representative of NIM (China) takes part in COOMET TC 1.8 meetings.

Comparisons with NIM (China) in the field of determining the nutritional value of a number of food products are underway, as well as pilot comparisons in the field of measuring low values of gas permeability of rocks, and key comparisons on natural gas. Planned are pilot comparison on measuring chlorine content in crude oil and measuring sulfur content in coal (Coordinator – NIM, China).

**EURAMET**

Cooperation with the EURAMET TC Metchem consists mainly of participation in the international comparisons.

**SIM**

Cooperation with SIM is conducted primarily in the framework of participation in international comparison projects.

**ISO TCs**

TC 1.8 representatives participated in development of standards and carried out expert reviews of ISO TC 158 (Gas analysis), ISO TC 69 (Applications of statistical methods), and ISO TC 212 (Clinical laboratory testing and in vitro diagnostic test systems).

**OIML**

VNIIM and VNIIFTRI representatives head OIML TC 17 “Instruments for physico-chemical measurements” and its subcommittees (SC 2 “Saccharimetry”, SC З “рН-metry”, SC 4 “Conductometry”, SC 5 “Viscosimetry”, SC 6 “Gas Analysis”), and participate in development and expert review of OIML publications.

**5 IMPLEMENTATION OF THE CIPM MRA**

**CMCs related activity**

XXVth cycle of the COOMET CMC review was completed. The results were published in the BIPM KCDB.

As part of the cycle, the following positions were approved and published:

**VNIIM (including UNIIM – branch of VNIIM):**

* for gas analysis: 6 new, 36 revised positions,
* for surface analysis: 2 new positions,
* for inorganic analysis: 2 new positions,
* for electrochemical analysis: 1 new position,
* for organic analysis: 1 new and 1 revised position.

To date, in the field of Chemistry and Biology the BIPM KCDB contains 584 CMCs of VNIIM (including UNIIM), 17 CMCs of VNIIFTRI, 31 CMCs of BelGIM, and 11 CMCs of KazStandart.

COOMET CMCs’ distribution by measurement categories is as follows: Gases – 408, Organic solutions – 6, Inorganic solutions – 30, Metals and alloys – 14, Sediments, soils, ores, and particulates – 21, High purity chemicals – 72, Biological fluids and materials – 9, Food – 19, Water – 5, Electrolytic conductivity – 18, Advanced materials – 31, Other materials – 10.

With regard to the CMCs of a new XXVI cycle, the situation is as follows:

The intraregional review is completed. In the new cycle, the following CMCs were claimed:

**VNIIM:**

* Gas Analysis: 4 new, 365 reviewed,
* Organic Analysis: 10 new, 6 reviewed,
* Bioanalysis: 4 new.

**UNIIM – branch of VNIIM:**

* Inorganic Analysis and Electrochemistry: 12 new.

**VNIIFTRI:**

* Inorganic Chemistry: 5 new,
* Electrochemistry: 1 new.

**BelGIM:**

* Gas Analysis: 1 revised.

Experts: representatives of VNIIFTRI, VNIIM, UNIIM – branch of VNIIM, and BelGIM take part in the interregional review.

**Participation of COOMET NMIs in the CCQM comparisons**

Participation of COOMET active members in international pilot and key comparisons is organized. In 2024:

VNIIM participated in 4 CCQM comparisons in the field of gas analysis (did not take part in 2 comparisons due to issues related to transporting the samples), 1 comparison in the field of isotope analysis, 5 comparisons in the field of organic analysis, 8 comparisons of CCQM-NAWG and CCQM-CAWG, and 1 comparison in the field of electrochemical analysis.

UNIIM – branch of VNIIM participated in 3 CCQM-EAWG/IAWG comparisons.

VNIIFTRI participated in 3 comparisons in the field of electrochemistry and in 1 comparison in the field of inorganic analysis. VNIIFTRI did not take part in comparisons in the field of quantity and number concentration of particles, and in the field of inorganic analysis due to issues related to transporting the samples.

**6 MEETINGS AND EVENTS**

* All-Russian Conference of the Metrology Educational Cluster of Rosstandart, dedicated to the 300th anniversary of the Russian Academy of Sciences and 190th anniversary of the birth of D.I. Mendeleyev, March 27 – 31, 2024, St. Petersburg.
* International Scientific and Practical Conference “Metrology 2024”, dedicated to the 100th anniversary of the Belorussian Chamber of Weights and Measures, April 9 – 10, 2024, Minsk, Belarus.
* 8th Russian-Chinese EXPO and seminar “Metrology in medicine and healthcare”, May 17 – 21, 2024, Harbin (China).
* International scientific and practical conference under the auspices of World Metrology Day “We measure today for a sustainable tomorrow”, June 6, 2024, Tashkent (Uzbekistan).
* 1st online meeting of the expert group between the NMIs of the Rosstandart and the Iranian National Standardization Organization (INSO), August 6, 2024.
* 13th online meeting of the Working Subgroup on cooperation in metrology of the Permanent Russian-Chinese Working Group on Cooperation in Standardization, Metrology, Conformity Assessment and Inspection Control, December 11-12, 2024.
* Meeting of TC 1.8 “Physical Chemistry”, October 29 – 30, 2024, VNIIFTRI, Mendeleyevo, Moscow, in hybrid format.

**7 INFORMATION ON THE EXPECTED VENUE AND DATE OF THE NEXT TC 1.8 MEETING**

The next meeting of TC 1.8 "Physical Chemistry" will be held in September 2025 at VNIIM, St. Petersburg, in hybrid format. The dates will be determined as the work proceeds.

|  |  |  |
| --- | --- | --- |
| ChairCOOMET TC 1.8 “Physical Chemistry” |  | Yuri A. Kustikov |

10/03/2025