ANNUAL REPORT
of COOMET TC 1.8 "Physical Chemistry"
for 2021

1 GENERAL CHARACTERISTICS OF COOPERATION IN THE SUBJECT FIELD

Activities of the COOMET 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 24 NMIs from 19 COOMET member countries are represented in TC 1.8: AzMI (Azerbaijan); CJSC "NBSM" (Armenia); BelGIM (Belarus); IMBIH (Bosnia and Herzegovina); BIM (Bulgaria); PTB and BAM (Germany); GEOSTM (Georgia); KazStandard (Kazakhstan); CSM (Kyrgyzstan); INIMET (Cuba); FTMC (Lithuania); INM (Moldova); NIM (China); TUBITAK UME (Turkey); VNIIM, VNIIFTRI, UNIIM – branch of VNIIM, VNIIOFI, VNIIMS (Russia); SMU (Slovakia); Tajikstandart (Tajikistan); Ukrmetrteststandart (Ukraine); and UzNIM (Uzbekistan).

In 2021 TC 1.8 "Physical Chemistry" had the following main areas of activities:

- 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 of an internal review of CMCs of COOMET NMIs, as well as the interregional CMC review of institutes from other RMOs;
- planning and organization of international comparisons and interlaboratory research;
- familiarizing of TC 1.8 members with the CCQM and COOMET documents aimed at the realization of the CIPM MRA provisions and ensuring of 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 member countries' 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, VNIIM, UNIIM – branch of VNIIM, and VNIIOFI coordinate the TC's projects.

VNIIM coordinates the following projects:

- COOMET project 611/RU-a/13: Pilot comparison "Melamine in milk powder". Participants: VNIIM, UNIIM – branch of VNIIM, Ukrmetrteststandart. Draft B report was prepared.
- COOMET Project 708/RU-a/16: Pilot comparison "Purity of anthracene ("100 minus impurities" principle)". Participants: VNIIM, UNIIM - branch of VNIIM. The Final report was prepared.

- COOMET Project 772/RU-a/18: Key comparison “Carbon dioxide in Air at urban level (480-800) μmol/mol”. Participants: VNIIM, BelGIM, Ukrmetrteststandart, KazStandard, NMC/A*STAR, (Singapore). Draft A report was prepared.
- COOMET Project 824/RU/21: Pilot comparison “Sulfur in isooctane”. Participants: VNIIM, NIM (China), IMBIH (Bosnia and Herzegovina). Draft Technical Protocol was prepared and sent to NIMs for approval.
- COOMET Project 775/RU-a/19: Pilot comparison “Electric conductivity of 25 S/m and 10 μS/cm potassium chloride solutions”. Participants: VNIIM, UNIIM - branch of VNIIM, GEOSTM, BelGIM, NIM (Moldova), KazStandard, OOO “Sibprompribor-Analit”. Draft B report was prepared and sent to the participants of Draft A report.

UNIIM – branch of VNIIM coordinates the following projects:

- COOMET Project 849/RU/21: Pilot comparison “Mass fraction of metals (Cu, Zn, Mg, Fe, Ni, Sr, Cd, Pb) in blood serum”. Participants: UNIIM – branch of VNIIM, VNIIOFI, Ukrmetrteststandart. Experimental research is carried out.

VNIIOFI coordinates the following projects:

- COOMET Project 806/RU-a/20: Pilot comparison “Mass fraction of Al in pure aluminium”. Participants: VNIIOFI, Ukrmetrteststandart, BAM (Germany), TÜBİTAK UME (Turkey). Preparation stage of comparisons.
- COOMET Project 807/RU-a/20: Pilot comparison “Mass fraction of Mg in pure magnesium”. Participants: VNIIOFI, Ukrmetrteststandart, BAM (Germany). Preparation stage of comparisons.
- COOMET Project 808/RU-a/20: Pilot comparison “Mass fraction of Ni in pure nickel”. Participants: VNIIOFI, Ukrmetrteststandart, BAM (Germany), TÜBİTAK UME (Turkey). Preparation stage of comparisons.
- COOMET Project 809/RU-a/20: Pilot comparison “Mass fraction of Ti in pure titanium”. Participants: VNIIOFI, UNIIM-branch of VNIIM, Ukrmetrteststandart, BAM (Germany). Preparation stage of comparisons.

In 2021 the following projects were completed:

- COOMET project 784/RU/19: Bilateral pilot comparison “Measurement of water content in crude oil”. Participants: NIM (China) and VNIIM (Russia);
- COOMET project 756/RU/18: Pilot comparison “Mass fraction of oxygen and nitrogen in steel”. Participants: UNIIM- branch of VNIIM (Russia), BAM (Germany);
- COOMET Project 618/RU-a/13: Pilot comparison “Composition of Ni-based alloys”. Participants: VNIIOFI, UNIIM-branch of VNIIM (Russia), BelGIM (Belarus), Ukrmetrteststandart (Ukraine), CSM under ME of KR (Kyrgyz Republic).

TC 1.8 Planned projects

Coordinating NMI	Project title	Comparison type
VNIIM	Automotive emission gases	COOMET Key comparison
VNIIM	Quantitative determination of human DNA	COOMET Pilot comparison
VNIIM	Isotope composition of alcohol	COOMET Pilot comparison
VNIIM	Concentration of copies of the bacterial genome of mycoplasma	COOMET Pilot comparison
UNIIM – branch of VNIIM	Mass fraction of carbon in steel	COOMET Pilot comparison
VNIIFTRI	pX measurements of sodium ions activity at pNa ≈ 1.1	COOMET Pilot comparison
VNIIFTRI	pH measurements of oxalate buffer solution at pH ≈ 1.65	COOMET Pilot comparison
VNIIFTRI	pH measurements of phosphate buffer solution at pH ≈ 7.0	COOMET Key comparison
NIM	Inorganic and organic chlorides in crude oil	COOMET Pilot comparison

3 RESULTS OF THE RECENT TC 1.8 MEETING

The recent meeting COOMET TC 1.8 "Physical Chemistry" was held on October 28 – 29, 2021 in St. Petersburg, Russia, at VNIIM named after D.I.Mendeleev.

27 representatives of the following NMIs attended the meeting: BelGIM (Belarus), Ukrmetrteststandart (Ukraine), KazStandard (Kazakhstan), NIM (China), Tajikstandart Agency (Tajikistan), UzNIM (Uzbekistan), VNIIM, UNIIM — branch of VNIIM, VNIIOFI, VNIIFTRI, VNIIMS (Russia), as well as the COOMET Secretariat.

The following reports were made:

- on the resolutions of the COOMET Committee and COOMET Presidential Council,
- information from the TC 1.8 representatives who are members of the CCQM WGs on participation in the activities of the Consultative Committee and its Working Groups and its strategy,
- on the realization of program COOMET P6/2021 “COOMET Roadmap on implementation of decisions related to the redefinition of the basic units of the International System of Units SI for 2020–2024”,
- on the transition of COOMET member countries to new editions of ISO/IEC 17025:2017 and ISO 17034:2016, and
- reports from the TC 1.8 Members who are representatives of Ukrmetrteststandart, BelGIM, KazStandard, Tajikstandart, and UzNIM on the state of affairs in their NMIs.

The Chairs of the TC 1.8 subcommittees presented the results of the ongoing COOMET comparison projects.

Two new SCs were created:

- SC 1.8.7 “Characterization of particles”, and
- SC 1.8.8 “Isotope analysis”.

The following priority areas of the TC 1.8 activity were identified:

- Climate change and clean air,
- Energy efficiency,
- Metrology in medicine, and
- Food safety.

A training seminar "Metrology of stable isotopes" was held for the meeting participants.

4 RESULTS OF THE IMPLEMENTATION OF THE COOMET STRATEGY AND COOMET DEVELOPMENT PROGRAM (concerning the activities of TC 1.8)

TC 1.8 members took part in the implementation of a number of activities provided for in the COOMET Development Program for 2020-2022 and Roadmap for the implementation of the COOMET Strategy for 2020-2025, namely:

- 9. (Ind-a.1.9) Carrying out of an analysis of the timeframe for conducting COOMET comparisons and taking corrective actions for its reduction: work was carried out on the official completion of comparisons in the KCDB performed under the auspices of TC 1.8;
- 19. (Ind-a.4.1) Preparation and implementation of a Roadmap for TC 1.2 – TC 1.11 for the implementation of decisions related to the redefinition of the SI base units; work is being performed on the planned activities within the area of responsibility of TC 1.8;
- 78. Drawing up and implementation of a Plan for the preparation of COOMET Recommendations, having requirements for calibration of various groups of measuring instruments (Guide on calibration): at the meeting of TC 1.8 in 2021 it was decided to "Facilitate the organization of traineeships of specialists from countries with emerging metrology systems (CEEMS) for their training and assistance in preparing calibration procedures required in a country".

5 COOPERATION WITH INTERNATIONAL AND REGIONAL ORGANIZATIONS

CCQM

TC 1.8 representatives are involved in the CCQM activities almost since its creation, 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) is an Associate Member. VNIIM representatives took part in the APMP General Assembly meeting. VNIIM also participated in the annual TCQM APMP meeting.

In 2021, VNIIM and NIM organized COOMET pilot comparisons of sulfur in isooctane as a simulator of petroleum products.

EURAMET

Cooperation with the EURAMET TC Metchem consists mainly of participation in the international comparisons and realization of bilateral agreements with NMIs of EURAMET member states. VNIIM also participates in the EMPIR project in the field of stable carbon isotope metrology.

SIM

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

ISO TCs

TC 1.8 representatives participated in the 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 3 "pH-metry", SC 4 "Conductometry", SC 5 "Viscosimetry", SC 6 "Gas Analysis"), and participate in development and expert review of OIML publications.

6 IMPLEMENTATION OF THE MRA

Activities on CMCs preparation

XXII cycle of the COOMET CMC review was completed. The results were published in the international base of BIPM KCDB, namely:
To date the BIPM KCDB contains 650 entries of VNIIM (including UNIIM), 17 entries of VNIIFTRI, 42 entries of Ukrmetrteststandart, 26 entries of BelGIM and 7 entries of KazStandard in the field of Chemistry and Biology.
COOMET CMCs' distribution by measurement categories is as follows: Gases – 439, Organic solutions – 6, Inorganic solutions – 28, Metals and alloys – 14, Sediments, soils, ores, and particulates – 21, High purity chemicals – 68, Biological fluids and materials – 9, Food – 18, Water – 9, Electrolytic conductivity – 3, Advanced materials – 29, Other materials – 6.
With regard to the CMCs of a new XXIII cycle, the situation is as follows:
The intraregional review is completed, and the interregional review is ongoing. In the new cycle, the following CMCs were claimed:

VNIIM:

- Gases: 2 new, 67 reviewed,
- Isotope analysis: 1 new,
- Electrolytic conductivity: 1 new.

UNIIM – branch of VNIIM:

- Inorganic analysis: 2 new ("Inorganic solutions" and "High purity materials").

VNIIFTRI:

- Electrolytic conductivity: 1 reviewed.

Kazstandard:

- Gases: 2 new.

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

In 2021 the lists of COOMET TC 1.8 experts on CMC review and COOMET technical experts on peer review of the QMS of NMIs/DIs were updated.

Participation of COOMET NMIs in the CCQM comparisons

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

In 2021:

VNIIM participated in most of the CCQM comparisons in the field of gas analysis (10 comparisons), isotope analysis (3 comparisons), organic analysis (8 comparisons), inorganic analysis (1 comparison), CCQM-NAWG (2 comparisons), and CCQM-CAWG (1 comparison).

VNIIFTRI participated in 5 comparisons in the field of inorganic analysis, electrolytic conductivity, and gas analysis, 2 of which belong to the field of quantity and number concentration of particles. VNIIFTRI, alongside with National Metrology Institute of Japan (NMIJ) is a co-coordinator of the CCQM-K19.2018 comparison “pH measurement of borate buffer solutions at pH ~9,18”. According to the Technical protocol, VNIIFTRI was responsible for the preparation and certification of samples; NMIJ was responsible for collecting the participant’s data, processing the results, and preparation of Draft reports A and B. Due to the COVID-19 pandemic, some participants were unable to take part in the comparison, therefore at the online meeting of the EAWG in 2021, it was decided to carry out an additional comparison CCQM K19-2018.1, where VNIIFTRI will process the data and prepare Draft reports A and B, and NMIJ will prepare and certify the samples. The samples were disseminated in November 2021.

UNIIM – branch of VNIIM participated in 4 CCQM-IAWG comparisons, 1 CCQM-EAWG comparison, 1 CCQM-IRWG comparison, and 1 CCQM-SAWG comparison. UNIIM -branch of VNIIM coordinated and co-coordinated 2 CCQM key comparisons in the field of surface analysis (CCQM.K172) and inorganic analysis (CCQM.K173).

VNIIMS participated in 1 CCQM-NAWG comparison related to SARS-CoV-2.

7 MEETINGS AND EVENTS

On May 19, 2021, representatives from VNIIM, VNIIMS, and VNIIFTRI organized and participated in the International public discussion “Measurements for healthcare”, which was held as a hybrid meeting.

On July 7, 2021, representatives from VNIIM and VNIIMS organized and participated in the Russian-Chinese online workshop “Metrology in medicine and healthcare”.

On 15 October 2021 TC members took part in the webinar "The practice of implementation of the documents of the CIPM MRA and COOMET publications on carrying out and evaluation of results of calibration and comparison".

On 25-26 October, 2021, VNIIM and VNIIMS representatives participated in the 10th Russian-Chinese Working Subgroup on metrological assurance of energy resources accounting.

On 09-11 November, 2021, VNIIM representatives participated in the X Jubilee International scientific-practical conference “Molecular Diagnostics 2021”.

On 07-09 December, 2021 VNIIM representatives participated in the JCTLM-ICHCLR-IFCC Workshop – Overcoming challenges to global standardization of clinical laboratory testing: reference materials and regulations.

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

The next meeting of TC 1.8 "Physical Chemistry" will be held in October 2022 at VNIIM (St. Petersburg, Russia).

9 PROPOSALS TO RESOLUTIONS OF THE COOMET COMMITTEE

- To approve updated document COOMET D5.6 "Regulation on Technical Committee "Physical Chemistry" (TC 1.8)" (replacing COOMET D5.6/2014) – Annex 1.
- To endorse the decision on establishing the following subcommittees within TC 1.8:
  - SC 1.8.7 "Particle Characterization";
  - SC 1.8.8 "Isotope analysis".
- To endorse the decision on changing the names of the following subcommittees within TC 1.8:
  - SC 1.8.3 "Non-organic analysis" (instead of "Pure non-organic substances");
  - SC 1.8.5 "Organic analysis" (instead of "Organic and non-organic analysis").

Chair
COOMET TC 1.8 “Physical Chemistry” — Prof. L.A.Konopelko

Deputy Chair
COOMET TC 1.8 “Physical Chemistry” — Y.A. Kustikov