



## ANNUAL REPORT of COOMET TC 1.8 “Physical Chemistry” for 2020-2021

### 1 GENERAL INFORMATION

Activities of the COOMET Technical Committee 1.8 “Physical Chemistry” covers those measurement services, which could be referred to “Metrology in chemistry and biology” field.

#### COOMET TC 1.8 members

26 NMIs from 21 COOMET Member-Countries are represented in TC 1.8 now. They are: AzMI (Azerbaijan), NIM (Armenia), BelGIM (Belarus), IMBIH (Bosnia and Herzegovina), BIM (Bulgaria), PTB and BAM (Germany), GEOSTM (Georgia), KazStandart (Kazakhstan), CSM (Kyrgyzstan), CIM (North Korea), INIMET (Cuba), VMT (Lithuania), INM-MD (Moldova), INM (Romania), NIM (China), TUBITAK UME (Turkey), VNIIM, VNIIFTRI, UNIIM – branch of VNIIM (hereinafter UNIIM), VNIIOFI, VNIIMS (Russia), SMU (Slovakia), Tajikstandart (Tajikistan), Ukrmetrteststandart (Ukraine) and UzNIM (Uzbekistan).

#### In 2020/21 the work of COOMET TC 1.8 “Physical Chemistry” was carried out in the following directions:

- Organization and realization of the work on the preparation of the NMI CMC data of the COOMET Member States that have signed the MRA.
- Organization and realization of the internal review of CMC for COOMET NMIs and the interregional review of NMI CMCs for other regional metrological organizations.
- Planning and organizing of international comparisons and interlaboratory researches.
- Getting the TC 1.8 Members acquainted with the CCQM and COOMET documents aimed at the realization of the MRA.
- Improvement of the TC 1.8 structure.

### 2 TC 1.8 PROJECTS

The NMIs of the COOMET Member States as well as interested metrological centers and designated laboratories of other countries that have an appropriate basis of standard equipment can take part in the TC projects connected with carrying out of international comparisons and pilot researches. The TC projects are coordinated at present by VNIIM, UNIIM, VNIIOFI.

#### VNIIM is the coordinator of:

- COOMET Project № 611/RU-a/13: Pilot comparison "Melamine in milk powder". Participants: VNIIM, UNIIM, Ukrmetrteststandart; Draft B report is prepared.
- COOMET Project 708/RU-a/16: «Pilot comparison «Purity of anthracene». Participants: VNIIM, UNIIM. Final report is prepared.
- COOMET Project № 772/RU/18: Key comparison «Carbon dioxide in Air at urban level (480-800)  $\mu\text{mol/mol}$ » Participants: VNIIM, BelGIM, Ukrmetrteststandart, KazStandart, NMC/A\*STAR, (Singapore). Return of the comparison samples to the participants and stability measurements.
- COOMET Project № 775/RU/19: Pilot comparison «Determination of the electrolytical conductivity of potassium chloride solutions at 20 S/m and 10  $\mu\text{S/cm}$ ». Participants: VNIIM, UNIIM, GEOSTM, BelGIM, NIM-MD,

KazStandart, «Sibprompribor-Analit»). Draft A report is prepared and sent to the participants for approval.  
 - COOMET Project № 824/RU/21: Pilot comparison “Determination of sulfur in iso-octane”. Participants: VNIIM, NIM (China), IMBIH (Bosnia and Herzegovina). Project of the technical protocol is prepared and sent for approval to NIM.

**NIM of China/VNIIM as the Coordinators:**

- COOMET Project 784/RU/19: Pilot bilateral comparison “Measurement of water content in crude oil”. Participants: NIM and VNIIM. Draft B report is prepared.

**UNIIM is the coordinator of:**

- COOMET Project 756/RU-a/18: Pilot comparison in the field of measuring the mass fraction of oxygen and nitrogen in steel. Participants: UNIIM, BAM. Draft A report to be agreed.

- COOMET Project 782/RU/19: Pilot comparisons in the field of measuring of the mass fraction of moisture and protein in grain. Participants: UNIIM, BelGIM, Ukrmetrteststandart, KazStandart and others. Final report is prepared. The comparison showed that the participants are ready to conduct key comparison, taking into account the conclusions made, and also confirmed the possibility of preparing homogeneous samples and transporting them.

**VNIIOFI is the coordinator of:**

- COOMET Project 618/RU-a/13 Pilot comparison in the field of composition of Ni-based alloys. Participants: VNIIOFI, UNIIM, BelGIM, Ukrmetrteststandart, CSM ME (Kyrgyzstan). Draft B report is prepared.

- COOMET Project № 806/RU/20 «Pilot comparison in the field of Al mass fraction measurement in pure aluminium». Participants: VNIIOFI, Ukrmetrteststandart, BAM (Germany). Preparation to the comparison.

- COOMET Project № 807/RU/20 «Pilot comparison in the field of Mg mass fraction measurement in pure magnesium». Participants: VNIIOFI, Ukrmetrteststandart, BAM (Germany). Preparation to the comparison.

- COOMET Project № 808/RU/20 «Pilot comparison in the field of Ni mass fraction measurement in pure nickel». Participants: VNIIOFI, Ukrmetrteststandart, BAM (Germany). Preparation to the comparison.

- Проект COOMET № 809/RU/20 «Pilot comparison in the field of Ti mass fraction measurement in pure titanium». Participants: VNIIOFI, Ukrmetrteststandart, BAM (Germany). Preparation to the comparison.

**Planned projects of TC 1.8 NMIs**

Pilot NMI	Name	Type of COOMET comparison
VNIIM	Natural gas	Key comparison
VNIIM	Quantitative determination of human DNA.	Pilot study
VNIIFTRI	pX measurements of sodium ions activity, pNa ≈ 1.1	Pilot study
VNIIFTRI	pH measurements of oxalate buffer solution, pH ≈ 1.65	Pilot study
VNIIFTRI	pH measurements of phosphate buffer solution, pH ≈ 7.0	Key comparison

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

The TC1.8 "Physical Chemistry" meeting was not held in 2020 due to the Covid – 19 pandemic.

The last meeting of TC 1.8 «Physico-Chemistry» was held in VNIIM in May 22-23.05.2019.

The representatives from Belarus (BelGIM), Ukrmetrteststandart (Ukraine), China (NIM), Kazakhstan (KazStandart), Kyrgyzstan (CSM ME), Moldova (INM-MD), UzNIM (Uzbekistan) and Russia (VNIIM, VNIIFTRI, UNIIM) took part in the meeting.

### **4 COOPERATION WITH THE INTERNATIONAL ORGANIZATIONS**

#### **CCQM**

Representatives of TC 1.8 have participated in CCQM activity practically since the time of its establishment and became the members of the following working groups: KCWG (Key Comparisons working group), QAWG (Organic Analysis working group), GAWG (Gas Analysis working group), IAWG (Inorganic Analysis working group), PAWG (working group on Protein Analysis) NAWG (working group on Nucleic Acid Analysis), CAWG (working group on Cell Analysis), SAWG (working group on Surface Analysis), EAWG (Electrochemical Analysis working group) and IRWG (newly established working group on Isotope Analysis).

#### **APMP**

Since 2008 VNIIM (Russia) has become the full member of APMP, KazInMetr (Kazakhstan) is an associated member of this Regional Metrological Organization. VNIIM representatives took part in the APMP General Assembly meeting. VNIIM also participated in the annual TCQM APMP meeting.

In 2018 VNIIM and NIM organized bilateral comparison in the field of measuring of water content in crude oil (COOMET project 784/RU/19) which are currently ongoing. In 2021 a pilot comparison in the field of sulfur content measurements in isooctane as a simulator of petroleum products (COOMET project 824/RU/21) was organized.

#### **EURAMET**

Cooperation with TC Metchem EURAMET consists mainly of participation in the international comparisons and realization of bilateral agreements with NMIs of EURAMET Member-Countries. VNIIM also participates as a collaborator in the EMPIR project 19 ENV05 STELLAR "Stable isotope metrology to enable climate action and regulation".

#### **SIM**

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

#### **ISO TC**

Representatives of TC 1.8 participate in development of standards and carry out an expertise in the ISO TC 158 (Gas Analysis) and ISO TC 69 (Applications of statistical methods).

#### **OIML**

Representatives of VNIIM and VNIIFTRI are the heads of OIML TC 17 "Physico-chemical measurements" and its sub-committees (SC) (SC2 "Saccharimetry", SC3 "pH-metering", SC4 "Conductometry", SC5 "Viscosimetry", SC6 "Gas Analysis", and participate in a development and expertise of the International Recommendations and Documents.

## 5 ACTIVITIES ON IMPLEMENTATION OF MRA

### Organization and realization of works on preparation of the CMC data:

The review of cycle XXI QM CMCs was completed. The results are published in the BIPM KCDB.

For COOMET they are as follows:

- 3 new positions, 25 revised and 13 positions deleted in the field of gas analysis, 6 revised and 18 deleted in organic analysis field (on the part of VNIIM);
- 7 new positions, 9 revised in the field of gas analysis, 1 revised position in the field of organic analysis and 1 new in the field of inorganic analysis (on the part of Ukrmetrteststandart);
- 5 new positions in the field of inorganics and 5 deleted in the organics field (on the part of UNIIM);
- 6 revised positions in gas analysis field (on the part of KazStandart);
- 8 new positions, 7 revised and 2 positions deleted in the field of gas analysis, 1 new position in the electrochemical analysis field (on the part of BelGIM);

At present, the International CMC Database (BIPM KCDB) contains 644 positions of VNIIM including UNIIM, 15 positions of VNIIFTRI, 42 positions of Ukrmetrteststandart, 26 positions of BelGIM, 7 positions of KazStandart. Distribution of the COOMET CMCs according to measurement categories is the following: gas analysis – 518; organic solutions – 7; inorganic solutions – 15; metals and alloys – 14; sediments, soils, ores and particles – 21; high purity chemicals – 66; biological fluids and materials – 9; foods – 16; water – 13; electrochemical analysis – 25, advanced materials – 20, other materials – 10.

Arrangements made for the COOMET CMCs review of cycle XXII are as follows:

The intra-regional review was completed.

The CMCs were claimed by

#### **VNIIM:**

in the field of gas analysis – 7 new positions, 1 for revision,  
organic analysis – 12 new positions (in categories: “High purity chemicals”, “Advanced materials”, “Food”);

#### **Ukrmetrteststandart:**

in the field of electrochemical analysis - 1 new position (“pH”);

#### **VNIIFTRI:**

in the field of electrochemical analysis - 4 new position (“pH” and “Electrolytic conductivity”);

#### **UNIIM:**

in the field of inorganic analysis – 13 new positions (category “Inorganic solutions”),  
in the field of surface analysis – 2 new and 1 revised position (“Advanced materials”)  
in the field of electrochemical analysis - 1 new position (“High purity chemicals”).

Reviewers: representatives of VNIIFTRI, VNIIM, Ukrmetrteststandart, UNIIM.

All the CMCs were presented for inter-regional review.

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

Planning and organization of participation of the active COOMET member-states in the international (key and pilot) comparisons is provided.

In the period from March 2020 to March 2021

VNIIM participated in the most part of CCQM comparisons in the field of gas analysis (10 comparisons), isotope analysis (2 comparisons), organic analysis (6 comparisons), inorganic analysis (1 comparison), 2 comparisons of NAWG and 1 comparison of CAWG.

VNIIFTRI participated in 5 comparisons in the field of electrochemical, inorganic analysis and in the field of charge, number and number concentration of particles (2 comparisons). VNIIFTRI is the co-coordinator of one of the CCQM key comparison in the electrochemical field.

VNIIM participated in 4 comparisons of IAWG, 2 comparisons of EAWG, 1 comparison of IRWG, and 2 comparisons of SAWG. VNIIM coordinated 3 CCQM key comparisons in the field of surface analysis and electrochemistry.

VNIIMS participated in the comparisons of PAWG (1 comparison).

## 6 EVENTS AND MEETINGS

VNIIM representatives took part in the international on-line workshop "International System of Units (SI) in Fair Digital Data" on February 22-26, 2021.

The next meeting of TC 1.8 "Physical chemistry" will be held in September, 2021 (St. Petersburg, VNIIM).

The Chairman of COOMET  
TC 1.8 "Physical chemistry"



Prof. L.A. Konopelko

March 2021