

# Conference Report

## CHanalysis 2024 – Analytical Technology Follows Innovation in Analytical Science

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In the usual venue of Beatenberg, near Interlaken, the Division of Analytical Sciences (DAS) of the Swiss Chemical Society hosted its annual event, again as a two-day conference. As many as 60 participants (a slight decline from 2023, due to the unfortunate concomitance of Analytica in Munich) attended CHanalysis on April 10–12, 2024 (Fig. 1). The sponsorship by Novartis, Roche, Syngenta, Analytical Bioanalytical Chemistry (SpringerNature), Agilent, Shimadzu, GMP, Waters, and Metrohm was extremely important for the success of the event: two days across the domain of analytical science. An evening opening with a plenary talk, followed by five thematic sessions, a poster pitch session (a great success), and a panel discussion on ‘analytical reliability’ kept the Swiss analytical community together. Awards to the best presentations, and the prestigious METAS Award were presented.

The plenary lecture was given by Prof. **Jacob Shelley** (Rensselaer Polytechnic Institute, NY/USA) who presented a fascinating phenomenon in the context of advanced analytical instrumentation, *i.e.* that of ion manipulation using acoustic waves. While still in a discovery stage, the phenomenon turns out very promising improvements of the signal-to-noise ratio of mass spectrometers or for the target analysis.

The first of the thematic sessions was opened by **Christoph Meyer** from Lonza Cell & Gene, who gave an insight from the Analytical Quality Control function in the commercialization of Cell and Gene Therapies. Autologous therapies make use of the

patients own blood cells which are, *ex vivo*, genetically reprogrammed to attack *e.g.* cancer cells. The manufacturing process of those treatments may be impacted by variability of the patient material. Thus, it is of utmost importance to have the analytical methods and analytical target profile capable of capturing the treatment’s quality target product profile.

**Christoph Jansen**, from one of the two Event Partners, Metrohm, presented a comprehensive review on the evolution of vibrational spectroscopy. This technique finds application in many industrial and cultural sectors, thanks to the compactness of the instrumentation. Prof. **Chan Cao** (University of Geneva) reported on single-molecule methods using nanopore technology for the analysis of glycan, playing a central role in health. Due to a structure complexity and heterogeneity, their analysis is challenging, especially if single molecules cannot be isolated. **Mihai-Ovidiu Değeratu** (Eawag) explained that chemical testing for aquatic risk assessment requires high numbers of fish samples, which raises ethical and economical concerns. Cell lines derived from fish tissues/organs represent a promising alternative analytical model for predicting chemical toxicity to fish. One gap is the insufficient knowledge about the properties of these cell lines, which could be closed by looking at molecular profiles (*e.g.* proteome). This could help improve our understanding of the cell lines’ general characteristics (*e.g.* cell morphology) as well as their (potential) functional capacity. This talk was awarded as the best student lecture.

The second session was opened by **Hanspeter Andres**, VP at METAS. METAS is the Swiss Federal Government’s competence centre for all questions related to measurement, measuring equipment and methods. Henceforth, its role within the Swiss analytical community is that of a lighthouse centrality, since 1862 (160<sup>th</sup> anniversary in 2022). Metrology is key to advance measurement science, and in fact this year’s CHanalysis also featured



Fig. 1. The participants to the CHanalysis annual DAS (Division Analytical Science) event in Beatenberg

a workshop on Analytical Reliability. **Andrea Rösch** (Agroscope) was congratulated on being the recipient of the 2024 METAS Award. A robust and systematic study led her and co-workers to the development of a multi-residue method for trace analysis of pesticides in soils. **Naresh Kumar** (ETH Zurich) presented first experimental evidence for mechanistic insights in oxygen activation on bulk Au(111) surface using Tip-Enhanced Raman Spectroscopy (TERS). Using isotopic labelling, TERS measurements confirmed that the oxidative species are generated by a water-mediated oxygen activation mechanism. Plasmonic near-field can not only enhance Raman signals, but fluorescence/photoluminescence signals as well. Whilst model catalytic systems can be studied using both AFM- and STM-TERS, AFM-TERS is more suitable for nanoscale investigation of real-life catalysts: TERS is not restricted to just surface catalytic processes, using microtoming even the internal architecture of chemically complex catalyst systems such as fluid cracking catalyst particles can be investigated.

The third session was opened by **Jens Jacobsen** (Waters Corp.) on a hot topic: recycling of polymeric materials requires special analytical testing R&D. Atmospheric Pressure Gas Chromatography (APGC) with a corona discharge is a powerful sample introduction and ionization technique showing a lot of advantages, especially for pyrolytic treatment (pyAPGC). A combination of analytical technologies such as TGA, DSC, SEC/GPC and py-APGC-MS is useful to understand the structure and properties of a material. This approach helps answer questions such as how much recycled plastics to use, how to optimize the materials and, ultimately to ensure the manufacturing of successful and safe products. **Gabriel Junquetti** (University of Geneva) discussed integrated electrochemical systems for enzyme-linked immunoassays. His colleague **Nikolai Tiuftiakov** showed results of exploring the limits of ionic liquid (IL) reference electrodes (RE) introduced by the Kakiuchi group in 2007, but still have not made a commercial breakthrough. His systematic study highlighted that (i) IL-REs are prone to failure due to ion-exchange with lipophilic solution ions; (ii) RE lifetime is short due to rapid loss of IL; (iii) higher IL lipophilicity should improve both the lifetime and the working range. A third talk from the University of Geneva was given by **Robin Nussbaum**. He reported on improving the sensitivity of pH glass electrodes with an alternative readout, obtained through a robust fundamental study of the instrumental parameters. Another exemplary study of the potential of analytical science, to go beyond the state-of-the-art of analytical technology. As Enrico Fermi once said: “*There are two possible outcomes: if the data confirms the hypothesis, then you’ve made a measurement. If the result is contrary to the hypothesis, then you’ve made a discovery.*”

**Fabian Tolle**, from the event partner Agilent Technologies, addressed another hot press topic: PFAS (per- and polyfluoroalkyl substances). This acronym has become very (in-)famous, also outside the chemical community, as one of the present times grand challenges, dubbed as forever chemicals. The participants of CHanalysis thus profited from an informative talk that would help them to be briefed about current relevant challenges in the analytical context, with high impact for the industry and society for the next decades. The first day was concluded with a new proposal which was extremely appreciated by the participants: poster pitches. In 300 seconds (5 minutes), the poster authors had to pitch their research. This happened extremely well, often without requiring the full time slot, and thus icebreaking for the consequent poster session. Best poster award was given to **Yaotian Wu** (University of Geneva) who presented a study on self-powered smart potentiometric sensor with relational operation function to capture concentration excursions.

The second and last day was opened by Prof. **Götz Schlotterbeck** (University of Basel) who reviewed the field of analytical

forensics. The tutorial character of his talk was much appreciated, widening the horizon of the participants beyond the lab scope. He also discussed myths presented by TV series that are not reflecting the reality that operators witness in the context of analytical chemistry in forensic chemistry and toxicology. **Andreas Kordikowski** (Novartis) discussed the impact of humidity and specifically the dynamic vapor sorption, in pharmaceutical industry context. The disseminative character of his lecture was informative. This is a unique character of CHanalysis, where the (Swiss) analytical community gather to share visions and insights, without segmentation and too much technical domain-jargon. **Fabian Weyand** (Empa) on the other hand presented a quite specific study on electrochemical sensing coupled to liquid-liquid phase extraction using hydrophobic deep eutectic solvents. His talk raised the attention of the specialists with a passionate Q&A time, which continued in the coffee breaks. CHanalysis also offers long networking breaks to promote the peer-to-peer exchange, besides the standard lectures. **Jawad Alzeer** (University of Palestine and UZH, Fig. 2) proposed an original model of analytical study, based on entropy and potential energy (as anti-entropy). This duality dimension describes contrasting trends towards the constitution, conformation, and configuration of chemical systems. **Rok Roskar** (SDSC) made the participants familiar with the Swiss Data Science Center (SDSC), its services for scientific IT, and the collaborative platform Renku, for sustainable data science. **Oscar Mendo-Diaz** (Empa) showed that beside fluorinated compounds, also chlorinated paraffins are a growing emergency, and a real analytical nightmare. Smart data tool (*i.e.* CPhunter) are fundamental for a complete analysis, not only for a fast lead time from measurement to discovery. Consequently, **Diana Roos** (METAS) presented the new world metrology organization-global atmospheric watch (WMO-GAW) central calibration laboratory for halogenated volatile organic compounds. The Swiss analytical community will meet again on 19-20 March 2025 in Beatenberg.

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Fig. 2. CHanalysis during one of the lectures.