



Press Release

International Association for the Properties of Water and Steam (IAPWS) 2022 Executive Committee and Working Group Meetings

Rotorua, New Zealand, November 27th – December 2nd, 2022

Following two years of online meetings, the IAPWS Executive Committee and Working Groups resumed their Annual meeting in-person and descended on the Novotel Lakeside Hotel in Rotorua, New Zealand. The main meetings included, 33 scientists, engineers and guests representing 13 countries and continues a series of meetings that began in 1929 in London, UK with the purpose to connect researchers and scientists with the engineers who use their work providing the researchers with guidance on topical problems within industry and providing the engineers with the latest research results. Areas of application include power cycle chemistry, high temperature aqueous technologies applicable to steam cycles, geothermal steam, electrode boilers, the use of high temperature water and supercritical steam in chemical and metallurgical processes, hydrothermal geochemistry, oceanography and global climate modelling, power cycles with CO₂ capture and storage systems and combined heat and power systems.

IAPWS produces releases and guidelines on the recommended scientific formulations for physical and chemical properties of water in its various forms as well as technical guidance documents that are the concerted opinion of IAPWS members on the best operating practices for power plant chemistry. IAPWS also documents certified research needs that represent the opinion of experts in their respective fields that a research topic is greatly needed to fill a current gap in knowledge. All this information is freely available and can be found on the IAPWS website at www.iapws.org.

The 2022 IAPWS Symposium was a joint event with Geothermal, The Next Generation and the New Zealand Geological and Nuclear Sciences (GNS) Crown Research Institute and was focused on the developing area of supercritical steam chemistry and potential applications and brought together geothermal researchers and IAPWS members to discuss and expand on this interesting area of science. The Symposium - “Supercritical and Subcritical Geothermal Steam Chemistry” - was held on Wednesday November 30th and included 65 delegates. The IAPWS Helmholtz award is presented to a developing



or early career scientist or engineer who is working in a field of interest to IAPWS. It includes an opportunity to attend the IAPWS meeting to present the Helmholtz Award lecture during the IAPWS Symposium. This year, the Helmholtz award was presented to Dr. Amish Patel, Associate Professor in Chemical and Biomolecular Engineering at the University of Pennsylvania, USA “For seminal theoretical and computational contributions to fundamental understanding of hydrophobicity, protein hydration and solvation of complex surfaces, and their application to the design of biologically derived materials.” Dr. Patel delivered an enlightening lecture about molecular dynamics modelling of superhydrophobic surfaces entitled “How do Surfaces with nanoscale Heterogeneity Perturb Water Structure”. Following the symposium, the IAPWS banquet was held at the Te Puia Geothermal Park and Maori Art and Crafts Institute. Delegates were treated to stunning visuals and were able to witness the power of water and steam in action with New Zealand’s largest geyser performing for all.



On Thursday December 1st, the IAPWS delegates participated in the NZAPWS Workshop entitled “Future of Industrial Steam in New Zealand” that welcomed over 110 participants from around New Zealand including steam users, equipment suppliers, engineers and chemists. Presentations focused on new electrode boiler systems, integration and upgrading biomass boiler systems and understanding mechanisms through which film forming substances mitigate corrosion.

IAPWS, through the various working groups, produces releases and guidelines, technical guidance documents (TGD) and IAPWS certified research needs (ICRN). These can all be found for free download on the IAPWS website at www.iapws.org. Throughout the week, the working groups progressed their activities, as reported below.

The Working Group on Thermophysical Properties of Water and Steam is beginning a project to replace the existing standard for the thermodynamic properties of water and steam, known as IAPWS-95. The new formulation will take advantage of new data from experiment and from molecular theory, and also of the advances since 1995 in technology for developing equations of state. As a first step, a project is being initiated to organize and evaluate the available data. The PROMETH2O project (www.prometh2o.eu) is developing the European metrological infrastructure and the measurement technologies to provide a robust traceability to trace water measurements in ultra high purity gases, filling the gap and meeting the needs of improved trace water measurement methods and standards for the amount fraction range between 5 ppm and 5 ppb (or, equivalently, between -65 °C and -105 °C frost point temperature).

The main topics discussed within the Industrial Requirements Working Group were the engineering requirements for wet steam calculations, new models for estimating low sulfur dewpoint in GTCC and new topics to extend the existing IRS scope. IRS are discussing these with other working groups and will be documented in white papers (dew point, new items, geothermal wet steam) and/or other forms. New topics such as hydrogen combustion, clouds micro- and macro-physics related to aviation are also considered to cooperate with ASME for evaluating attractive fields.

The Physical Chemistry of Aqueous Systems (PCAS) working group discussed MD-DFT approaches for electrical conductivity, all-atom MD analysis of crystal growth processes, structures and film-formation mechanisms of film-forming amines, and the ionization constant of water. The development of an IAPWS guideline for water self-diffusion is underway and will be continued.

The Power Cycle Chemistry (PCC) working group had an extremely productive meeting with a focus on re-establishing face-to-face contact between PCC members and restarting various projects that have been delayed over the past two years. Specific attention was on the area of film forming substances (FFS) with joint discussions between PCC and PCAS and a focus on identifying areas with a lack of information related to FFS and where future research/investigations are needed. An ICRN is currently in development. Progress updates on active International Collaboration projects related to corrosion product sampling and boiler corrosion were made and a draft TGD was presented on Flue Gas Condensate recovery which will be circulated for review and for approval in 2023. Updates on the joint PCC/IRS geothermal steam purity white paper were presented by both JAPWS and NZAPWS with progress intended to continue towards the completion of a draft TGD and possible approval in 2023.

The Executive Committee reviewed and approved all the above-mentioned working group activities, new chairs for working groups and also acknowledged two new IAPWS Fellows –Rich Pawlowicz (Canada) “For excellent leadership of the IAPWS Subcommittee on Seawater and the IAPSO/SCOR/IAPWS Joint Committee on the Properties of Seawater, including facilitating their cooperation with the BIPM” and Frank-Udo Leidich (Germany) “For longterm leadership in the Power Cycle Chemistry Working Group including service as Vice Chair and participation in the development of important Technical Guidance Documents, as well as for promotion of the use of these documents in industry.”

IAPWS welcomes scientists and engineers with interest in the thermophysical properties of water, steam, and aqueous systems and in the application of such information to industrial uses. The next IAPWS meeting will be in Turin, Italy from the 3rd – 8th September 2023. Further information on meetings can be found at the IAPWS website (www.iapws.org) as it becomes available. People interested in IAPWS documents and activities should contact the chairman of their IAPWS National Committee (see website) or the IAPWS Executive Secretary, Dr. R. Barry Dooley, bdooley@iapws.org. People do not need to be citizens or residents of member countries to participate.



**IAPWS and NZAPWS Workshop, December 1, 2022
Rotorua, New Zealand**