

PRESS RELEASE

INTERNATIONAL ASSOCIATION FOR THE PROPERTIES OF WATER AND STEAM

2017 ANNUAL MEETING, KYOTO, JAPAN

Continuing a series of conferences that began in 1929 in London, 102 scientists, engineers and accompanying persons from 13 countries attended the annual meeting of the International Association for the Properties of Water and Steam (IAPWS). The Japanese National Committee of IAPWS hosted the meeting between the 27th August and the 1st September 2017 at the Kyoto Research Park in Kyoto, Japan. The highlights of the IAPWS working group sessions and other proceedings of the executive committee are summarized in this release.

The primary purpose of the annual IAPWS meeting is to connect researchers and scientists with the engineers who use their information. This information exchange provides the researchers with guidance on topical problems within industry and provides the engineers with the latest research results. Areas of application include power cycle chemistry, high temperature aqueous technologies applicable to steam cycles and fuel cells, the use of high temperature water and supercritical steam in chemical and metallurgical processes, supercritical synthesis of new materials and destruction of toxic wastes, hydrothermal geochemistry, hydrometallurgy, oceanography and global climate modelling, power cycles with CO₂ capture and storage systems and combined heat and power systems including district heating.

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.

In the Working Group on Thermophysical Properties of Water and Steam (TPWS), preliminary approval was given to a new formulation for the thermodynamic properties of heavy water (D₂O). The new formulation makes use of new, high quality data from several research groups and uses state-of-the-art molecular calculations to constrain its gas phase properties. Replacing the previous standard that was developed over 35 years ago will allow more reliable and accurate analysis for certain types of nuclear plant and will provide more accurate properties for scientific studies. Also discussed were new experimental and modelling results for supercooled water and heavy water. These results assist in understanding aspects of the fundamental physics of liquid water that give rise to unusual (and in some cases biologically important) behavior of water at low temperatures.

The Industrial Requirements and Solutions (IRS) working group discussed matters around droplet nucleation and wet steam to increase efficiency and to protect from erosion of turbine

blades. This resulted in a task group to assess and develop the requirements for an industrial solution for discussion during the 17th ICPWS in 2018 and a targeted release in collaboration with ASME.

The Working Group on Physical Chemistry of Aqueous Systems (PCAS) discussed cavitation in pumps and condensation in steam turbines. Another topic was computational approaches such as free energy calculation of water adsorption in various polymers and its application to the rational design of polymers to improve the energy efficiency of separation processes. A new IAPWS Guideline has been proposed concerning the formulation of the self-diffusion coefficient over a wide range of temperature and density, which is expected to be completed in 2018.

The Subcommittee on Seawater continued working towards the traceability of marine measurements. Software and documents on the web site (<http://www.teos-10.org/>) continue to be heavily downloaded. Also, a recent set of review papers on this topic has been very well received in the scientific community. Significant progress has been made in talks with the International Bureau of Weights and Measures (BIPM) towards standardizing a traceable definition of relative humidity and getting this widely accepted. Several talks were also given on density measurements of different real seawaters. A series of open workshops are planned for next year's International Conference on the Properties of Water and Steam.

The Power Cycle Chemistry (PCC) working group worked intensively on the development of several new technical guidance documents (TGDs) involving demineralized water requirements, the effects of air in-leakage into steam-water cycles and the use of film forming amines and products in industrial plants and nuclear plants. Considerable progress was made and presented on a white paper for corrosion product sampling for plants on flexible operation. Steam requirements for geothermal plants was highlighted as an area of future interest for PCC.

IAPWS produces Certified Research Needs (ICRNs) as guidance for funding agencies and as an aid to people doing research in defining important research. To date, these have covered a variety of areas related to the properties of water and steam, seawater and the chemistry of power plants. A list of currently active ICRNs and closing statements on the progress made for those that have expired can be found on the IAPWS website.

A symposium entitled "Water and Steam: Energy Efficiency and Environmental Sustainability" was held on Wednesday 29th August 2017. The symposium included discussions on deep ocean temperatures, molecular simulation, modelling and design for wet steam turbine stages.



Several presentations were given focused on integrating advanced thermal power plants into the renewable energy infrastructure through coal gasification, CO₂ capture and ultra-supercritical power cycles. The IAPWS Helmholtz award lecture is

traditionally the cornerstone of the IAPWS Symposium. This year's award winner was Dr. Pavel Gotovtsev from the National Research Centre "Kurchatov Institute" in Russia. Dr. Gotovtsev was to present a talk entitled "Application of Machine Learning for Water Technologies - From Power Cycle Chemistry to Green Cities"; however, he was unable to attend the meeting. The IAPWS Helmholtz award is given annually to developing or early career scientists and engineers who are working in a field of interest to IAPWS. It includes an opportunity to attend the annual IAPWS meeting and to present the Helmholtz Award lecture.

The Executive Committee of IAPWS welcomed last year's new members New Zealand (Full Member), Egypt and China (Associate Members) and was pleased to have renewed participation from Italy (Associate Member). 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 held in conjunction with the 17th International Conference on the Properties of Water and Steam (ICPWS), September 2nd through 7th, 2018 in Prague, Czech Republic (www.icpws2018.com). Further information on the conference and working group meetings can be found on the conference webpage or at the IAPWS website (www.iapws.org) respectively.

People interested in IAPWS documents and activities should contact the Chairs of their IAPWS National Committee (see the IAPWS website for contact details) or contact the IAPWS Executive Secretary, Dr. Barry Dooley, bdooley@IAPWS.org. People do not need to be citizens or residents of member countries to participate in IAPWS activities.



Group photo of the participants of the 2017 IAPWS meeting, Kyoto, Japan.