

Supporting Efficient Thermophysical Research: Reference Materials and Good Reporting Practice

Ala Bazyleva^{C, S}

Thermodynamics Research Center (TRC), Applied Chemicals and Materials Division, National Institute of Standards and Technology (NIST), Boulder, CO, U.S.A.
ala.bazyleva@nist.gov

Scientific research frequently involves measurement of thermophysical properties. They create a foundation for characterization of new or industrially important materials, testing or support of a novel theory, improvement of existing measurements, and/or creation of a correlation or prediction model. A detailed analysis of thousands of publications from the field has shown that many efforts have not achieved the desired impact due to duplication, experimental errors, and/or absence of proper reporting. The nearly 80-year history of TRC and interactions with colleagues worldwide have revealed opportunities to increase the efficiency of experimental thermophysical research. Those opportunities are in planning, validation of experimental results, and data reporting. In cooperation with colleagues from academia and industry, TRC has been involved in a series of IUPAC projects dedicated to supporting researchers at all those stages. Two projects are presented here: one on reference materials for phase equilibrium measurements and one on good reporting practice.

Reference materials are necessary for inter-laboratory comparisons and validation of uncertainty claims for applied instrumentation and techniques. While many publications in the thermodynamics/thermophysics field nowadays deal with different kinds of phase equilibrium in mixtures, there are no commonly accepted recommendations on reference systems for testing equipment for such experiments. The objective of the IUPAC project #2011-037-2-100 is to provide a list of recommended reference mixture systems with reliable, critically evaluated property values covering solid-liquid, liquid-liquid, and vapor-liquid equilibria. The project is at the stage of report publication.

The goals of the IUPAC project #2019-013-1-100 are to collect, justify, and express the needs and expectations of the community on the information to be published after corresponding experimental research. The published project report summarizes principles of effective reporting of property measurement results and illustrates many aspects of good reporting on various examples. It is addressed to researchers, publishers, and funding agencies.