

Metrology for sustainable hydrogen energy applications: a project to address normative requirements

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Abstract

Hydrogen represents a clean and storable energy solution that could meet the worldwide energy demands and reduce greenhouse gases emission. The in-progress Joint Research Project « Metrology for sustainable hydrogen energy applications » of the European Metrology Programme for Innovation and Research (EMPIR) supported by the European Commission and organized by the European Association of National Metrology Institutes (EURAMET) aims at addressing standardisation needs through pre- and co-normative metrology research in the fast emerging sector of hydrogen fuel that meet the requirements of the European Directive 2014/94/EU.

The overall objective of the project is to address the standardisation needs by feeding the revision of two ISO standards that are currently too generic to enable a sustainable implementation in the hydrogen energy sector.

Directive 2014/94/EU states that the hydrogen purity dispensed at hydrogen refueling points should comply with the technical specifications included in the ISO 14687-2 standard "Hydrogen fuel - Product specification - Part 2 : proton exchange membrane (PEM) fuel cell applications for road vehicles" for fuel cell electric vehicles. The rapid progress of the fuel cell technology will require revising this standard towards less constraining detection limits as mentioned in the standard. While ensuring the hydrogen specifications, the application of the revised standard through optimized validated analytical methods will enable a reduction in the number of required analyses.

Furthermore, the increased transport and storage activities of hydrogen require the development of new and safe storage techniques for large quantities of hydrogen. The project aims also at developing and validating traceable methods to assess accurately the hydrogen mass absorbed and stored in metal hydrides; this is a research axis for the revision of the ISO 16111 standard "Transportable gas storage devices - Hydrogen absorbed in reversible metal hydride".

The standardisation work on the project consists in evaluating the probability of presence of hydrogen impurity affecting fuel cells and developing analytical techniques for traceable measurements of impurities. New data on maximum concentrations of each impurity based on the new fuel cell degradation studies and on the probability of presence will be determined and proposed.

It will consists also to develop and validate traceable methods for measuring the hydrogen mass absorbed in hydrides storage tanks AB, AB2 and AB5 with reference

to ISO 16111. Currently, the different methods available (i.e. mass methods, mass and volumetric flowmeters) do not provide accurate results.

The outputs of the project will have a direct impact on the standardisation works in the relevant working groups of ISO/TC 197 “Hydrogen technologies” with which the consortium has strong connections for both revisions of ISO 16111 and ISO 14687-2.