

HyCoRA input to ISO standardization work

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HyCoRA input to ISO WGs

- TC 197 Hydrogen Technologies
 - WG 24 Gaseous hydrogen fueling stations – General requirements
 - WG 28 Hydrogen fuel quality
 - WG 27 Hydrogen quality control
- TC 158 Analysis of gases
 - WG 7 Hydrogen fuel analytical methods

Liaison

- CEN TC 268 Cryogenic vessels
 - European hydrogen fuel standard
- ASTM standardization committees
 - D03 Gaseous fuels

TC 197 WG 24

- Input to 19880-1 HRS General requirements
- Sampling of gas and particulates
- Collected information about all sampling strategies available and chaired the writing
 - EU, JP, US input
- Currently Annex I in CD 1980-1

ISO 19880-1

Annex I

Sampling Procedures and Hardware for Hydrogen Fuel Quality Analysis

I.1 General

I.1.1 Sampling Hydrogen for Hydrogen Fuel Quality Analysis at 70MPa NWP

Analytical methods are divided into on-line analyses and off-line analyses. For the off-line analyses, sampling at the end of a nozzle should be performed at the hydrogen station. This informational Annex describes how this can be done.

TC 197 WG 27

- Input to revision of 14687
- Nitrogen change approved: 100 to 300 $\mu\text{mol} / \text{mol}$
- Revision of tolerance for HCHO and HCOOH
 - HyCoRA WP1 results show low effect
 - Current consensus is to have $\Sigma([\text{CO}], [\text{HCHO}], [\text{HCOOH}]) < 0.2 \mu\text{mol} / \text{mol}$, each at this level
- Revision of 'total halogenate' budget misnomer
 - HyCoRA data show $\text{C}_4\text{Cl}_4\text{F}_6$ and CH_2Cl_2 presence
 - Expect new definition with relevant species described
 - $\text{HCl} + \text{R-X}$
- Future requirements for CO to 0.1 $\mu\text{mol} / \text{mol}$ expected

TC 158 WG 7

- ISO/AWI 21087 Hydrogen fuel – Analytical methods – Proton exchange membrane (PEM) fuel cell application for road vehicles
- Validation protocol for analytical methods used for hydrogen fuel quality control
- List of known validated methods applicable to QC
- Contribution to writing of first draft
- Convened WG7 meeting in Seoul May 2017
- Community draft 2017-06-30

TC 197 WG 28

- Meeting attendance
- General contribution to ISO CD 19880-8

Fuel tolerance: ISO 14687

Constituents (assay)	Type I, Type II Grade D
Hydrogen fuel index (minimum mole fraction) ^a	99,97 %
Total non-hydrogen gases	300 µmol/mol
Maximum concentration of individual contaminants	
Water (H ₂ O)	5 µmol/mol
Total hydrocarbons except Methane ^b (C1 equivalent)	2 µmol/mol
Methane (CH ₄)	100 µmol/mol
Oxygen (O ₂)	5 µmol/mol
Helium (He)	300 µmol/mol
Nitrogen (N ₂)	300 µmol/mol
Argon (Ar)	300 µmol/mol
Carbon dioxide (CO ₂)	2 µmol/mol
Carbon monoxide (CO)	0,2 µmol/mol
Total sulfur compounds ^c (S1 equivalent)	0,004 µmol/mol
Formaldehyde (HCHO)	0,01 µmol/mol
Formic acid (HCOOH)	0,2 µmol/mol
Ammonia (NH ₃)	0,1 µmol/mol
Total halogenated compounds ^d (Halogen ion equivalent)	0,05 µmol/mol
Maximum particulates concentration	1 mg/kg
For the constituents that are additive, such as total hydrocarbons and total sulfur compounds, the sum of the constituents shall be less than or equal to the acceptable limit.	

Separate line

Each 0.2 µmol /mol

$\Sigma ([CO], [HCHO], [HCOOH]) \leq 0.2$

- Total: no method, halogen ion equivalent

Mist, aerosol, size

Input to standardization process

- Standardized testing
 - (Short) Stack
 - Fuel recirculation
- Test conditions
 - T, P ...
- HyCoRA results shown with contrast to CO, UHP H₂
 - Important for credibility