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Fuel cell electric vehicles - Hydrogen consumption - Test methods

燃料电池电动汽车　氢气消耗量　测量方法

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Foreword

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard was proposed by the Ministry of Industry and Information Technology of the People's Republic of China.

This Standard shall be under the jurisdiction of the National Technical Committee of Auto Standardization (SAC/TC 114).

The drafting organizations of this Standard: China Automotive Technology and Research Center, Tongji University, China Automobile Engineering Research Institute Co., Ltd., SAIC Motor Corporation Limited, Chinese Academy of Sciences Dalian Institute of Chemical Physics, Zhejiang University, Tsinghua University.

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Fuel cell electric vehicles - Hydrogen consumption - Test methods

1 Scope

This Standard specifies the test method for hydrogen consumption of fuel cell electric vehicles.

This Standard applies to fuel cell electric vehicles on which compressed hydrogen is used (hereinafter referred to as “vehicles”).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition dated applies to this document. For undated references, the latest edition of the referenced documents (including all amendments) applies to This Standard.

GB 18352.5-2013, *Limits and measurement methods for emissions from light-duty vehicles*

GB/T 19754-2015, *Test methods for energy consumption of heavy-duty hybrid electric vehicles*

GB/T 24548, *Fuel cell electric vehicles - Terminology*

3 Terms and definitions

For the purposes of this document, the following terms and definitions and those defined in GB/T 24548 apply.

3.1

pressure-temperature method

A method for the calculation of hydrogen consumption by measuring the pressure and temperature of the gas in high-pressure hydrogen tanks before and after test. Use hydrogen tanks of known internal volume whose temperature and pressure can be measured.

3.2

weight analysis method

Annex A

(Normative)
Pressure-temperature method

A.1 Test hydrogen tank is installed outside the vehicle as the fuel supply source of the fuel cell electric vehicle.

A.2 Test hydrogen tank is connected with fuel cell through a bypass pipeline which is installed inside fuel pipe in the fuel cell system. The bypass pipeline shall be installed securely to prevent leakage, release or entry into the air which is caused by vibration.

A.3 Fuel filling pressure shall be adjusted to the range recommended by the manufacturer.

A.4 Test hydrogen tank shall comply with the following requirements:

--the internal volume of accessories (such as pressure reducing valves and pipelines) is known;

--the internal air pressure and air temperature can be tested;

--the change in volume during the high-pressure filling process is small;

--it has been calibrated.

A.5 Test is conducted in accordance with the following procedure:

a) conduct test in accordance with the test procedure specified in 5.2;

b) before starting test, first test the air pressure and air temperature of test hydrogen tank;

c) after test, test the air pressure and air temperature of test hydrogen tank;

d) substitute the air pressures and temperatures tested before and after test into Equation (A.1) and calculate hydrogen consumption:

$$w = m \times \frac{V}{R} \times \left(\frac{P_1}{Z_1 \times T_1} - \frac{P_2}{Z_2 \times T_2} \right) \quad \cdots\cdots (A.1)$$

where,

w--the fuel consumption during measurement, in g;

m--the molar mass of hydrogen molecule (2.016), in g/mol;

Annex B

(Normative)
Weight analysis method

B.1 Test hydrogen tank is installed outside the vehicle as the fuel supply source of the fuel cell electric vehicle.

B.2 Test hydrogen tank is connected with fuel cell through a bypass pipeline which is installed inside fuel pipe in the fuel cell system. The bypass pipeline shall be installed securely to prevent leakage, release or entry into the air which is caused by vibration.

B.3 Fuel filling pressure shall be adjusted to the range recommended by the manufacturer.

B.4 When weighing equipment is used to weigh test hydrogen tank before and after test respectively, appropriate measures shall be taken to mitigate the influences of the factors including vibration, convection current and environmental temperature, such as attenuating plate and windshield glass.

B.5 The weight of hydrogen tank shall be as light as possible.

B.6 The test procedure is as follows:

a) before test, use weighing appliance to weigh test hydrogen tank;

b) connect test hydrogen tank to pipeline. During connection, set the pressure in pipeline equal to the air pressure in tank to ensure there is no gas input or output;

c) conduct test in accordance with the test procedure specified in 5.2;

d) when starting measurement, switch valve body to supply fuel from test hydrogen tank;

e) after test, close the valve of test hydrogen tank;

f) after test, withdraw test hydrogen tank from pipeline and use weighing equipment to weigh test hydrogen tank tested.

B.7 Substitute the weights of test hydrogen tank tested before and after test into Equation (B.1) and calculate hydrogen consumption:

$$w = g_1 - g_2 \qquad \text{(B.1)}$$

where,

w--the fuel consumption during measurement, in g;

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