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GB/T 35544-2017

**Fully-Wrapped Carbon Fiber Reinforced Cylinders with
an Aluminum Liner for the On-Board Storage of
Compressed Hydrogen as a Fuel for Land Vehicles**
车用压缩氢气铝内胆碳纤维全缠绕气瓶

(English Translation)

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Fully-Wrapped Carbon Fiber Reinforced Cylinders with an Aluminum Liner for the On-Board Storage of Compressed Hydrogen as a Fuel for Land Vehicles

1 SCOPE

This standard specifies the types and parameters, specifications, test methods, inspection rules, and marking, packaging, transportation and storage requirements with respect to the fully-wrapped carbon fiber reinforced cylinder with an aluminum liner for the on-board storage of compressed hydrogen as a fuel for land vehicles (hereinafter referred to as the “cylinders”).

This standard is applicable to the design and manufacture of the refillable cylinders that are fixed in road vehicles as fuel tanks to store compressed hydrogen, with a nominal working pressure $\leq 70\text{MPa}$, a nominal water capacity $\leq 450\text{L}$, and a working temperature $\geq -40^\circ\text{C}$ and $\leq 85^\circ\text{C}$.

Note: The manufacture and inspection of the gas cylinders for hydrogen supply intended for urban rail transit powered by hydrogen fuel cell, etc. may use this standard as a reference.

2 NORMATIVE REFERENCES

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

GB/T 192	General purpose metric screw threads - Basic profile
GB/T 196	General purpose metric screw threads - Basic dimensions
GB/T 197	General purpose metric screw threads - Tolerances
GB/T 228.1	Metallic materials - Tensile testing - Part 1: Method of test at room temperature
GB/T 230.1	Metallic materials - Rockwell hardness test - Part 1: Test method (Scales A, B, C, D, E, F, G, H, K, N, T)
GB/T 231.1	Metallic materials - Brinell hardness test - Part 1: Test method
GB/T 232	Metallic materials - Bend test
GB/T 1458	Test method for mechanical properties of ring of filament-winding reinforced plastics
GB/T 3191	Aluminum and aluminum alloys extruded bars, rods
GB/T 3246.1	Inspection method for structure of wrought aluminum and aluminum alloy products - Part 1: Inspection method for microstructure
GB/T 3362	Test methods for tensile properties of carbon fiber multifilament
GB/T 3880.1	Wrought aluminum and aluminum alloy plates, sheets and strips for general engineering - Part 1: Technical conditions of delivery
GB/T 3880.2	Wrought aluminum and aluminum alloy plates, sheets and strips for general engineering - Part 2: Mechanical properties
GB/T 3880.3	Wrought aluminum and aluminum alloy plates, sheets and strips for general engineering - Part 3: Tolerances on forms and dimensions
GB/T 3934	Specification of gauges for general purpose screw threads
GB/T 4437.1	Aluminum and aluminum alloy extruded tubes - Part 1: Seamless tubes
GB/T 4612	Plastics - Epoxy compounds - Determination of epoxy equivalent
GB/T 6519	Ultrasonic inspection of wrought aluminum and magnesium alloy products

GB/T 7690.3	Reinforcements - Test method for yarns - Part 3: Determination of breaking force and breaking elongation for glass fiber
GB/T 7762-2014	Rubber, vulcanized or thermoplastic - Resistance to ozone cracking - Static strain test
GB/T 7999	Optical emission spectrometric analysis method of aluminum and aluminum alloys
GB/T 9251	Methods for hydrostatic test of gas cylinders
GB/T 9252	Method for pressure cycling test of gas cylinders
GB/T 11640	Seamless aluminum alloy gas cylinders
GB/T 12137	Method for leakage test of gas cylinders
GB/T 13005	Terminology of gas cylinders
GB/T 15385	Method for hydraulic burst test of gas cylinder
GB/T 17394.1	Metallic materials - Brinell hardness test - Part 1: Test method
GB/T 19466.2	Plastics - Differential scanning calorimetry (DSC) - Part 2: Determination of glass transition temperature
GB/T 20668	Unified screw threads - Basic dimensions
GB/T 20975 (all parts)	Methods for chemical analysis of aluminum and aluminum alloys
GB/T 26749	Carbon fiber - Determination of tensile properties of resin-impregnated yarn
GB/T 30019	Carbon fiber - Determination of density
GB/T 33215	Pressure relief devices for gas cylinders
YS/T 67	Wrought aluminum and aluminum alloy columniform ingots

3 TERMS, DEFINITIONS AND SYMBOLS

3.1 Terms and Definitions

For the purposes of this document, the terms and definitions given in GB/T 13005 and the followings apply.

3.1.1 aluminum liner

The seamless aluminum alloy vessel over which the carbon fiber reinforced layer is wrapped to sealing gas, and which may or may not afford partial pressure load

3.1.2 fully-wrapped

A wrapping mode in which the carbon fiber with a resin impregnated matrix is wrapped continuously over the aluminum liner in spiral and circumferential pattern so as to reinforce the cylinder in circumferential and axial directions

3.1.3 fully-wrapped cylinder

A cylinder for which the carbon fiber reinforced layer is fully wrapped over the external surface of the aluminum liner and then subjected to heat-curing process

3.1.4 nominal working pressure

Limited filling pressure for the cylinder at a reference temperature of 15°C

3.1.5 autofrettage

The pressurization process, in which the aluminum liner is subjected to plastic deformation by applying internal pressure to the cylinder, so that the aluminum liner endures pressure stress and the carbon fiber endures tensile stress when the cylinder is at zero pressure

3.1.6 autofrettage pressure



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