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Modified material of ultra-high
molecular weight polyethylene for
pipe lining

改性超高分子量聚乙烯管材衬里专用料

(English Translation)

(报批稿)

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Foreword

SAC/TC 162 is in charge of this English translation. In case of any doubt about the contents of English translation, the Chinese original shall be considered authoritative.

This standard was proposed by China Petroleum and Chemical Industry Federation.

This standard was prepared by SAC/TC162 National Technical Committee 162 on Non-metallic Chemical Equipment of Standardization Administration of China.

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Modified material of ultra-high molecular weight polyethylene for pipe lining

改性超高分子量聚乙烯管材衬里专用料

1 Scope

This standard specifies the terms and definitions, classification, marking, requirements, test methods, inspection rules and marking, packaging, transportation and storage of modified material of ultra-high molecular weight polyethylene for pipe lining.

This standard is applicable to modified material of ultra-high molecular weight polyethylene for pipe lining with its melt mass flow rate (MFR) greater than or equal to 0.01 g/10 min and not more than 0.8 g/10 min under a load of 21.6 kg at 190 °C.

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 1040.1, *Plastics — Determination of tensile properties — Part 1: General principles*

GB/T 1040.2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics*

GB/T 1634.1, *Plastics — Determination of temperature of deflection under load — Part 1: General test method*

GB/T 1634.2, *Plastics — Determination of temperature of deflection under load — Part 2: Plastics, ebonite and long-fibre-reinforced composites*

GB/T 1843, *Plastics — Determination of izod impact strength*

GB/T 2918, *Plastics — Standard atmospheres for conditioning and testing*

GB/T 3682, *Determination of the melt mass — flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*

GB/T 6679, *General rules for sampling solid chemical products*

GB/T 8170-2008, *Rules of rounding off for numerical values & expression and judgement of limiting values*

GB/T 19077.1, *Particle size analysis — Laser diffraction methods — Part 1: General principles*

ISO 1628-3, *Plastics— Determination of the viscosity of polymers in dilute solution using capillary viscometers—Part 3: Polyethylenes and polypropylenes*

ISO 2818, *Plastics —Preparation of test specimens by machining*

ISO 15527: 2010, *Plastics — Compression -moulded sheets of polyethylene (PE-UHMW, PE-HD) — Requirements and test methods*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

Ultra-high molecular weight polyethylene (hereinafter referred to as PE-UHMW)
Polyethylene with molecular weight over 1 million.

3.2

Modified material of ultra-high molecular weight polyethylene for pipe lining

The ultra-high molecular weight polyethylene (PE-UHMW) blended with other polymers or inorganic fillers for flow modification, so that it can be extruded molding in the PE-UHMW pipe lining, in which the PE-UHMW is in a continuous phase to maintain its excellent mechanical properties.

4 Classification and marking

4.1 Classification

The products shall be classified as type 1, type 2 and type 3 according to its viscosity number. Classification method see Table 1.

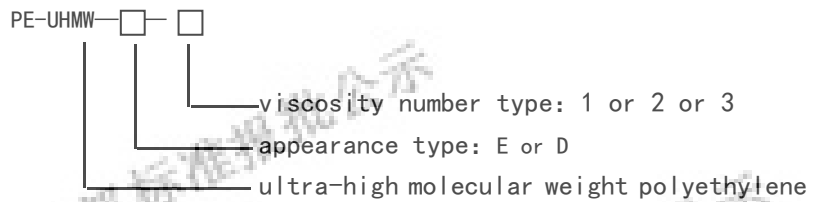
Table 1 — The classification of the modified material of ultra-high molecular weight polyethylene for pipe lining

Classification	Type 1	Type 2	Type 3
Viscosity number (mL/g)	≥ 900 , and $< 1\ 500$	$\geq 1\ 500$, and $< 2\ 100$	$\geq 2\ 100$

The products can be classified into extruded particles (type E) and powder (type D) according to their appearance.

4.2 Marking

The products can be marked as follow:



For example: PE-UHMW-E-1 represents the modified material of ultra-high molecular weight polyethylene for pipe lining, with appearance of extruded-particle and viscosity which is greater than or equal to 900 mL/g, and less than 1500 mL/g.

5 Requirements

The technical specification for products shall be as specified in Table 2.

Table 2— Technical specifications

Serial number	Items	Targets		
		Type 1	Type 2	Type 3
1	Viscosity number (mL/g)	≥ 900 and $< 1\ 500$	$\geq 1\ 500$ and $< 2\ 100$	$\geq 2\ 100$
2	Melt mass flow rate (MFR) (190 °C, 21.6 kg) / (g/10 min)	≥ 0.01 and ≤ 0.8		
3	Yield strength/MPa	≥ 22		
4	Tensile fracture strength/MPa	≥ 33		
5	Tensile strain at break/%	≥ 350		
6	Izod impact strength/KJ/m ²	Not broken		
7	Relative abrasion index	≤ 130		
8	Temperature of deflection under load/°C	≥ 65		
9	Particle size/%	Extruded particles (> 2 mm)	≤ 10	
		Powder (> 400 μm)	≤ 10	

6 Test methods

6.1 Preparation of test specimens

The test specimens shall be prepared from extruded pipes by using the machining method in accordance with ISO 2818.

6.2 Condition regulation and test environment of test specimens

The condition of test specimens shall be adjusted according to GB/T 2918.

All tests shall be carried out under the testing environment specified in GB/T 2918.

6.3 Viscosity number

The viscosity number tests shall be according to ISO 1628-3.

6.4 Melt mass flow rate

The melt mass flow rate test shall be according to GB/T 3682 at a temperature of 91 °C and a load of 21.6 kg.

6.5 Yield strength, tensile fracture strength and tensile fracture elongation at break

The yield strength, tensile fracture strength and tensile fracture elongation at break tests shall be according to GB/T 1040.1 and GB/T 1040.2. The test specimen is type 1B, and the test is 50 mm/min.

6.6 Izod impact strength

The tests shall be according to GB/T 1843, using the 22J pendulum.

6.7 Relative abrasion index

The relative abrasion index test shall be according to Annex B and Annex C in ISO 15527: 2010. The relative abrasion index is represented by the arithmetic mean value of the test results of 5 samples, which are retained integers. The maximum difference of the parallel determined values is not more than 10% of the arithmetic mean value.

6.8 Temperature of deflection under load

The temperature of deflection under load test shall be carried out according to GB/T 1634.1, GB/T 1634.2, method B.

6.9 Particle diameter

The particle diameter tests shall be carried out according to GB/T 19077.1.

7 Inspection rules

7.1 Grouping and sampling

Production per day shall be set as a batch, the maximum of which is 10 t for the producer, or as a batch of received products for the users. Sampling shall be carried out according to GB/T 6679, with sampling units number randomly selected. Samples shall be taken about 200 g from each package by sampling drilling, whose total amount shall not be less than 2000 g. After fully mixed, the samples shall be divided into test and retention samples by quartation, and be packed in two clean plastic bags and sealed with label marked with product name, batch number, production date, batch amount, sampling person's name. Test samples shall be retained for three months to be reinspected.

7.2 Inspection

All requirements of the product are the contents of ex-factory inspection. Tests shall be according to this standard and judged by the quality inspection department in the manufacture factory. The products can leave the factory after being qualified. Each batch of products shall be attached with quality certificate when leaving the

factory.

When one inspection result does not conform to the requirements of this standard, the batch of products shall be resampled with double number sampling units. When one of the indicators is still not conformed after the reinspection, the batch of products shall be judged as unqualified and not be permitted leaving the factory.

7.3 Inspection results judgment

The judgment of inspection results shall be according to rounding-off numerical value comparison method in GB/T 8170, 4.3.3.

7.4 Inspection certificate

Each batch of products shall be provided with an inspection certificate including the following contents:

- a) Test results according to different items of this standard (indicating whether the test results conform to this standard);
- b) The type of the products;
- c) Batch number;
- d) Test date;
- e) Inspector and approver;
- f) The enterprise name (stamped).

8 Sign, packaging, transport and storage

8.1 Sign

There shall be a clear and firm sign on the outer packing bag of the product. The sign shall include: trademark, enterprise name and address, the standard number, product name, model, production date, batch number and net content.

8.2 Packaging

The products shall be packaged by polypropylene woven bags lined with polyethylene film bags or other packaging materials. Packing products shall not contaminate and leak in transportation, storage and stacking. The packing specification of the product is $25\text{ kg} \pm 0.25\text{ kg}$, and the average net content of each batch shall not be less than 25.0 kg per bag.

8.3 Transport

In the course of transport, the bagged products shall be prevented from being broken by sharp hook, being exposed to the sun or the rain.

8.4 Storage

The products shall be stored in a ventilated, dry and clean warehouse with good fire

protection facilities. When in storage, the products shall be prevented from heat sources and direct sunlight, and strictly forbidden to be stacked in the open air.

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