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Health Protection Index Vehicle Antibacterial and Anti-mold Testing and Evaluation Protocol

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Vehicle Antibacterial and Anti-mold Testing and Evaluation Protocol

1 Scope

This document specifies the antibacterial and anti-mold testing and evaluation methods for main components in passenger cars.

This document is applicable to the antibacterial and anti-mold testing and evaluation of specified components in passenger cars, and it can be used as a reference for other components made of the same material.

2 Normative References

The following normative documents contain provisions which, through reference in this text, constitute indispensable provisions of this document. For dated references, only the dated edition applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

QB/T4341 Antibacterial Polyurethane Synthetic Leather - Test for Antibacterial Activity and Efficacy

GB/T 20944.3 Textiles - Evaluation for Antibacterial - Part 3: Shake Flask Method

GB/T 24346 Textiles - Evaluation of Anti-mould Activity

QB/T 4199 Leather - Test Method for Anti-mould

3 Terms and Definitions

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

3.1 passenger car

a vehicle designed and constructed primarily for carrying passengers and their luggage and/or their temporary goods, having not more than 9 seats (including the driver's seat) and which can be equipped with certain special equipment or apparatus and may also tow a center-axle trailer

[Source: GB 7258-2017, 3.2.1.1]

3.2 Artificial leather

a general term for the materials covering the seats and other components in the vehicle other than leather and textiles, including polyurethane synthetic leather, PVC and microfiber

3.3 antibacterial activity

the activity of product to inhibit bacterial growth and reproduction, which is characterized with bacteriostatic rate for textiles, and antibacterial rate for dermis and artificial leather

3.4 anti-mold activity

the activity of product to inhibit mold spore germination and mycelial growth, which is characterized with anti-mold grades for textile, leather and artificial leather

4 Vehicle Confirmation and Sample Collection

4.1 Vehicle confirmation

Confirmation of vehicle appearance and performance. See Tables 1 and 2 for the list of key parts and the confirmation form of basic information of sample vehicle.

Table 4.1 List of Key Parts

Name	Color	Material	Thickness	Manufacturer
Seat				
Steering wheel				
A/C filter element				

Table 4.2 Confirmation Form of Basic Information of Sample Vehicle

Item	Sample Description
Product name	
Specification & model	
VIN	
Sales model	
Manufacturer	
Trademark	
Design passenger capacity (person)	
Date of manufacture	

4.2 Sample source

The samples of steering wheel skin, seat skin and A/C filter element shall be cut and sampled from the vehicle. If the samples are not sufficient, they can be purchased from the sales market authorized by the vehicle manufacturer.

4.3 sample collection

Use a mechanical tool (including but not limited to scissors and driller) to take samples at the part positions specified in Table 1 in such a way that the samples are representative and uniform as much as possible to ensure that the analysis results can correctly reflect the quality of vehicle interior trims.

- For the same material at the same position, only 1 sampling point is required. For example, if it is confirmed that the materials of 4 seats are the same, samples can be taken only from 1 seat; if not the same, samples shall be taken from all the seats.

- For different materials at the same position, samples of different materials shall be taken for test. For example, the seats are made of red and black leather alternately. Both the red and black leather shall be sampled, but if either material is not sufficient for the test, no test will be carried out.

- For the same material at different positions, separate samples shall still be taken for test. Note: Different types of materials shall be distinguished by color first.

5 Test Method

The test method can be selected based on the equipment and technical conditions if two or more test methods are available for the same item.

5.1 Test of antibacterial activity

Only the materials of seat skin and A/C filter element will be tested and evaluated. The steering wheel is taken as an observation item and its skin material will be tested but not evaluated, and the test result will not be included in the total evaluation score for the time being.

5.1.1 Test method

Samples of textile are tested according to GB/T 20944.3-2008 *Textiles - Evaluation for Antibacterial - Part 3: Shake Flask Method*, with *Staphylococcus aureus*, *Escherichia coli* and *Candida albicans* used.

Samples of leather and artificial leather shall be tested according to QB/T4341-2012 *Antibacterial Polyurethane Synthetic Leather - Test for Antibacterial Activity and Efficacy*, with *Staphylococcus aureus*, *Escherichia coli* and *Candida albicans* used.

5.2 Test of anti-mold activity

Test and evaluate the materials of seat skin and A/C filter element.

5.2.1 Test method

Samples of textile materials shall be tested according to GB/T24346-2009 *Textiles - Evaluation of Anti-mould Activity*, with *Aspergillus niger*, *Aspergillus terreus*, *Penicillium funiculosum* and *Trichoderma viride* used.

Samples of leather materials shall be tested according to QB/T 4199-2011 *Leather - Test Method for Anti-mould*, with *Aspergillus flavus*, *Aspergillus niger*, *Rhizopus stolonifer*, *Penicillium citrinum*, *Penicillium aurantiogriseum*, *Penicillium chrysogenum*, *Penicillium marneffeii* and *Trichoderma viride* used.

Samples of artificial leather shall be tested according to QB/T4341-2012 *Antibacterial Polyurethane Synthetic Leather - Test for Antibacterial Activity and Efficacy*, with *Aspergillus niger*, *Aspergillus terreus*, *Penicillium chrysogenum*, *Penicillium funiculosum*, *Aspergillus glaucus* and *Aspergillus clavatus* used.

6 Test Results

6.1 antibacterial activity

Textiles are characterized by the bacteriostatic rate of *Staphylococcus aureus*, *Escherichia coli* and *Candida albicans*.

$$Y = \frac{W_t - Q_t}{W_t} \times 100\% \quad (1)$$

Where,

Y - bacteriostatic rate of test sample;

W_t - average concentration of viable bacteria in the flask after 18 h shake contact of 3 control samples (CFU/mL)

Q_t - average concentration of viable bacteria in the flask after 18 h shake contact of 3 antibacterial fabric samples (or 3 non-antimicrobial treated fabric samples). The leather and artificial leather are characterized by the antibacterial rate of *Staphylococcus aureus*, *Escherichia coli* and *Candida albicans*.

$$R = \frac{B - A}{B} \times 100\% \quad (2)$$

Where,

R - Antibacterial rate;

B - Average number of bacteria recovered from blank sample (unit: CFU/slide)

A - Average number of bacteria recovered from the antibacterial sample (unit: CFU/slide)

6.2 anti-mold activity

Textiles, leather and artificial leather are judged according to the mold growth of control samples and test samples. If the grade difference between two parallel samples exceeds 1 grade, the test is invalid and another test is necessary. See Table 6.1 for specific judgment of anti-mold grade.

Table 6.1 Determination of Anti-mold Grade

mold Growth	Anti-mold Grade
No obvious mold under microscope	0
The mold grows sparsely or locally and covers less than 10% of the sample surface.	1
The mold covers less than 30% of the sample surface (10%~30%).	2
The mold covers less than 60% of the sample surface (30%~60%).	3
The mold covers 60% or more of the sample surface.	4

7 Rating of Results

7.1 Score composition

The full score of the vehicle antibacterial and anti-mold module is 100 points, and it consists of two indexes: antibacterial activity and anti-mold activity, 50 points for each. If there are different materials in the same part (note: different materials shall be distinguished by color first), all these materials will be tested and the scores of antibacterial activity and anti-mold activity will be calculated according to the lowest-scored materials.

7.2 Scoring rules for antibacterial activity

7.2.1 Scoring of antibacterial activity of A/C filter element

The score of antibacterial activity of A/C filter element is determined according to the lowest of bacteriostatic rates of *Staphylococcus aureus*, *Escherichia coli* and *Candida albicans* and it will be taken as the final score. See Table 7.1 for scoring rules.

Table 7.1 Scoring Rules of Antibacterial Activity of A/C Filter Element

Index	Evaluation Item	Full Score	Bacteriostatic rate (X)	Weight Coefficient
antibacterial activity	A/C filter element	30	$X \geq 99\%$	1.0
			$95\% \leq X < 99\%$	0.9
			$90\% \leq X < 95\%$	0.8
			$80\% \leq X < 90\%$	0.7
			$70\% \leq X < 80\%$	0.6
			$X < 70\%$	0.5

7.2.2 Scoring of Antibacterial Activity of Seat Fabric

The score of antibacterial activity of antibacterial activity of seat fabric is determined according to the lowest of bacteriostatic rates/antibacterial rates of Staphylococcus aureus, Escherichia coli and Candida albicans and it will be taken as the final score. See Table 7.2 for scoring rules.

Table 7.2 Scoring Rules for Antibacterial Activity of Textile, Leather and Synthetic Leather Seat Fabric

Index	Evaluation Item	Full Score	Bacteriostatic rate (X)	Weight Coefficient
antibacterial activity	Seat fabric	20	$X \geq 99\%$	1.0
			$95\% \leq X < 99\%$	0.9
			$90\% \leq X < 95\%$	0.8
			$80\% \leq X < 90\%$	0.7
			$70\% \leq X < 80\%$	0.6
			$X < 70\%$	0.5

7.3 Scoring rules for anti-mold activity

The anti-mold of all types of materials such as A/C filter element and seat fabric is evaluated by 5 grades. See Table 7.3 for scoring rules.

Table 7.3 Scoring Rules for Anti-mold Activity

Index	Evaluation Item	Full Score	Anti-mold grade	Weight Coefficient
anti-mold activity	A/C filter element	30	0	1.0
			1	0.9
			2	0.8
			3	0.6
			4	0.5
	Seat	20	0	1.0
			1	0.9
			2	0.8
			3	0.6
			4	0.5

7.4 Final score

The final score of the evaluated sample vehicle is the sum of the scores of antibacterial activity index and anti-mold activity index.