

**Test Method of Specified Requirements of
Far Infrared Textiles**

FTTS-FA-010

FTTS-FA-010 Far Infrared Textiles

Far-infrared is one band of the solar electromagnetic light-wave ranging in wavelength from 3 μ m to 1000 μ m. Far-infrared textiles are made with blends of polymer and nano- or micro-ceramic powder spun together with synthetic cotton, natural cotton and other fibers to make yarns and fabrics. Far-infrared materials can also be added during aftertreatment of an ordinary fabric. Far-infrared textiles absorb sunlight, or heat from human body, and pass the far-infrared – wavelength 4 to 14 μ m – back to the human body. This specific range of far-infrared is reputed to be most useful to the human body and is called “the rays of life” or “biogenetic rays.” When far-infrared rays strike the human body, their frequency is consistent with that of the body’s cellular movement. Far-infrared materials are particularly effective during activities in high mountain and snowy areas.

Taiwan technology for Far-infrared Textiles delivers average far infrared emissivity of not less than 0.85, and temperature variation more than 0.5 $^{\circ}$ C. The test method for these textiles is not yet regulated internationally.

1. Scope

This criterion is applicable to textiles except fibrous products and semi-products for medical use.

2. Terminology

Far Infrared Textiles: Textiles with capability of absorption and re-radiated in spectral wavelength of 3-14 μ m

3. Performance specification

The far infrared textile processing includes mixing of raw materials, coating, lamination and submerging. As products made of mixing of raw materials deliver the same durability of the fiber, the wash-resistance test would not necessary. For products come of coating, lamination and submerging processes will have to have the 10 times wash-resistance test based on AATCC 135 (1) (III) (A) iii prior to conducting the performance test. The performance test is conducted in ambient temperature and the criteria are given as below:

Evaluation		Qualification
Far Infrared Characteristics	Far Infrared Spectral Emissivity	The average emissivity not less than 0.80 determined by Far-Infrared spectrophotometer in wavelength of 3-14 μ m.
	Re-radiated	Difference in temperature between the test sample and reference sample not less than +0.5 $^{\circ}$ C and the effective

	Characteristics	difference is better than the reliable limit of 95%.
	* Meet any criterion given above.	
Temperature Characteristics	Thermograph	Average difference in temperature of skin in specific area while wearing test sample against wearing the reference sample not less than +0.5°C .
	Monitor Test	
	* Meet any criterion given above.	

4. Test method:

Test methods used for the evaluation of the performance of Far Infrared textile are illustrated as table 2.

Table 2 Test methods

Test item		Equipment	Remark
Far Infrared Characteristics	Far Infrared spectral Emissivity	Infrared spectrophotometer & Black Body	
	Re-radiated Characteristics	45 degree parallel radiation	
Temperature characteristics	Skin temperature	Thermograph	
		Thermal Imager	

Table 3 Sample Specifications

Test item	Sample for testing
Far Infrared Characteristics	Sample cut from Finished or half-finished products (fabric) At least 5 cm x 5 cm for opaque sample Triple of the above size for transparent sample
Temperature characteristics	Finished product The difference of fabric weight between testing sample and comparative sample should within 5%.

4.1 Emissivity evaluation

4.1.1 Equipment

Infrared spectrophotometer and Black Body

4.1.2 Testing sample

- (1) The sample for testing should have the same composition as the final product without covering any other material. The shape and volume are restricted to meet the measurement needs.
- (2) The area of the sample for testing should not less than 5 cm x 5 cm.

Opaque samples are to be measured using one layer. Transparent samples should be folded twice to form four layers for measurement.

4.1.3 Testing conditions

Opaque (could be folded) sample with tight construction but not affecting the heat conduction is preferred. Any source of high heat should be avoided around the working area. The sample for testing should not less than 5 cm x 5 cm. Measure the emissivity between 3-14 μ m and compare the emissivity of Black Body at the same temperature to obtain the emissivity of the fabrics. The emissivity should be measured at the sample surface temperature $55\pm 2^{\circ}\text{C}$.

4.1.4 Measurements

Far Infrared spectral emissivity should be measured at a specific sample surface temperature above 47°C . Five measurements should be made. Select the most smooth emission energy curve to obtain the emission value in order to compare with the emissivity of the Black Body.

4.2 Re-radiation characteristics (45 degree parallel)

4.2.1 Equipment

Re-radiation characteristics (45 degree parallel) analyzer.

4.2.2 Sample The sample for testing should have the same composition and shape as the final product. If the shape of sample is not suitable for testing, necessary processes without affecting the composition is acceptable (e.g. cotton fiber \rightarrow non-woven). The sample used for the comparison with the testing sample should have the same composition, construction and similar color as the testing sample. The difference of fabric weight between testing sample and comparative sample should within 5%.

4.2.3 Testing conditions

Testing should be conducted in a $20\pm 1^{\circ}\text{C}$, $50\pm 10\%$ RH conditioned room or under an environment with such temperature.

4.2.4 Measurements

Five samples should be tested. Average the values obtained from the five samples.

4.3 Test method for Temperature characteristics

4.3.1 Equipment

- (1) Thermograph
- (2) Thermal Imager (Monitor Test)

4.3.2 Condition setting

- (1) Condition setting of subject: the subject should be a healthy adult in tandard body weight.

Remark: To reduce the deviation, it is recommended that male in his twenties to thirties.

(2) Stabilized the subject

Keep working and resting ordinarily at least twelve hours

(3) Precondition: Each subject should keep in the rest status for 60 minutes in the conditioned room. Testing starts at the time before the stabilized subject wearing the sample. The relaxation interval is from worn -status for 30 minutes conditioning.

(4) Number of subject: not less than five subjects

(5) Material: final product or similarity

(6) Frequency: Twice testing for each subject

(7) Environment condition:	Temperature	17-25°C
	Relative Humidity	50±10%
	Atmospheric pressure	760mmHg

(8) Test Interval: Subjects keep relaxation for 60 minutes in conditioned room then remove the original wearing apparel to adapt to the environment for 20 minutes (i.e. before wearing). The testing material should be taken on for 30 minutes (taking-on) and then be taken off for 20 minutes interval (taking-off).

Detect the skin temperature of the subject at the total eight interval illustrated below:

5 minutes before wearing

5, 10, 20 & 30 minutes after wearing the testing material
5, 10 & 20 minutes after taking off the testing material

(9) Detecting point of the subject

Fabric: detecting the point on the middle line of left front arm of the subject.

bedquilt: detecting the point on the left chest.