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Textiles - Quantitative Chemical Analysis - Part 101: Mixtures of Soybean Protein Composite Fibre and Certain Other Fibers

纺织品　定量化学分析　第101部分：大豆蛋白复合纤维与某些其他纤维的混合物

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Textiles - Quantitative Chemical Analysis - Part 101: Mixtures of Soybean Protein Composite Fibre and Certain Other Fibers

1 Scope

This part of GB/T 2910 specifies chemical analysis methods for bi-component mixture of soybean protein composite fibre (composited with polyvinyl alcohol). It is applicable to the bi-component mixture of soybean protein composite fibre (composited with polyvinyl alcohol) and certain other fibers.

2 Normative References

The following normative documents contain provisions which, through reference in this part of GB/T 2910, constitute provisions of this part. For dated references, subsequent amendments to (excluding corrigendum), or revisions of, any of these publications do not apply. However, parties to agreements based on this part are encouraged to investigate the possibility of applying the most recent editions of the standards. For undated references, the latest edition of the normative document referred to applies.

GB/T 2910.1 Textiles- Quantitative Chemical Analysis - Part 1: General Principles of Testing (GB/T 2910.1 - 2009, ISO 1833-1: 2006, IDT)

3 Bi-component Mixture of Soybean Protein Composite Fibre and Cotton, Viscose Fibre, Modal Fiber, Polyacrylonitrile Fiber or Polyester (Method Using Sodium Hypochlorite/Hydrochloric Acid)

3.1 Principle

Dissolve and remove soybean protein of soybean protein composite fibre from the sample of known drying mass with 1 mol/L sodium hypochlorite solution, and then dissolve and remove the remainder (polyvinyl formal) of soybean protein composite fibre with 20% hydrochloric acid solution, collect, wash, dry and weigh the residues and calculate the corrected mass of residues in the drying quality of mixture. Obtain the mass fraction of soybean protein composite fibre from the difference.

3.2 Reagents

The reagents specified in GB/T 2910.1 and 3.2.1, 3.2.2, 3.2.3 and 3.2.4 of this part shall be used.

3.2.1 1 mol/L sodium hypochlorite solution

Add sodium hydroxide into 1 mol/L sodium hypochlorite to make its content of 5 g/L. This solution may be titrated with iodometric method to make its concentration of 0.9 mol/L ~1.1 mol/L.

3.2.2 Hydrochloric acid solution (with mass fraction of 20%)

Take 1000mL of concentrated hydrochloric acid (with density of 1.19 g/mL at 20℃) and slowly add it into 800mL water; cool it to 20℃ and add water into it so as to correct the density between 1.095 g/mL and 1.100g/mL. The concentration shall be controlled between 19.5 % and 20.5 %.

3.2.3 Dilute acetic acid solution

Dilute 5mL of glacial acetic acid with water to 1000mL.

3.2.4 Dilute ammonia water solution

Dilute 80mL of stronger ammonia solution (with density of 0.880 g/mL) to 1000 mL with water.

3.3 Apparatuses

The apparatuses specified in GB/T 2910.1 and 3.3.1 and 3.3.2 of this part shall be used.

3.3.1 Conical flask with stopper, of which the capacity is 250mL.

3.3.2 Water bath, keeping the temperature at 20℃±2℃.

3.4 Test procedures

The test shall be carried out according to the general principles specified in GB/T 2910.1 and the following procedures.

Put the prepared sample into a conical flask, add 100mL of sodium hypochlorite solution (3.2.1) for each gram of sample, oscillate seriously on the water bath (3.3.2) for 40 min. Filter it with the sintered glass crucible of known dry weight, wash the residues with a bit of sodium hypochlorite solution to the glass crucible, drain the liquid by vacuum suction, and then successively wash with water and neutralize with diluted acetic acid solution (3.2.3), finally, wash the residues continuously with water and drain the liquid by gravity and vacuum suction successively. Finally, vacuumize the crucible and residues and drain the liquid.

The test shall be carried out according to the general principles specified in GB/T 2910.1 and the following procedures.

Place a prepared sample into a conical flask, add 100mL of dimethyl formamide (4.2.1) into each gram of sample, plug the glass plug, shake the flask to fully moisten the sample, maintain the flask at 90℃~95℃ for 1h, and shake with hands slightly for five times during this time. Filter with sintered glass crucible and maintain the residues into the flask.

Add 60mL of dimethyl formamide, maintain 90℃~95℃ for 30min and shake with hands slightly for twice. Filter the residues into the sintered glass crucible, drain the liquids by vacuuming, wash the residues with water into the crucible, vacuumize and drain the liquid. Fill the crucible with hot water and wash the residues twice, drain the liquid by gravity and vacuumize it. Transfer the residues into the flask, add 160mL of water, maintain 5min under room temperature and shake severely from time to time. Filter the liquid into the crucible, and drain the liquid, wash for over three times, filter all the residues into the crucible at the last time, vacuumize and drain the liquid. Wash the flask with water, vacuumize it and finally dry, cool and weigh the crucible and residues.

4.5 Result calculation and expression

The result calculation and expression are in accordance with those specified in GB/T 2910.1, and the d value for soybean protein composite fibre is 1.01.

5 Mixture of Soybean Protein Composite Fibre and Polyamide (Method Using Glacial Acetic Acid)

5.1 Principle

Dissolve and remove the polyamide fiber from the sample of known drying mass with glacial acetic acid, collect, wash, dry and weigh the residues; calculate corrected mass in the drying mass of mixture. Obtain the mass fraction of polyamide fiber from the difference.

5.2 Reagents

The reagents specified in GB/T 2910.1 and 5.2.1 and 5.2.2 of this part are used.

5.2.1 Glacial acetic acid

Warning: This reagent is highly corrosive; thus, the user shall take perfect protection measures.

5.2.2 Dilute ammonia water solution

Take 80mL of stronger ammonia solution (with density of 0.880 g/mL) and dilute it to 1,000

mL with water.

5.3 Apparatuses

The apparatuses specified in GB/T 2910.1 and 5.3.1 and 5.3.2 of this part shall be used.

5.3.1 Conical flask with stopper, of which the capacity is not less than 200 mL.

5.3.2 Water bath: capable of keeping the water boiling.

5.4 Test procedures

The test shall be carried out according to the general principles specified in GB/T 2910.1 and the following procedures.

Place a prepared sample into a conical flask with stopper, add 100mL of glacial acetic acid (5.2.1) which is preheated nearly 100℃ into each gram of sample, keep for 20min in boiled water bath and shake from time to time. Filter it with sintered glass crucible of known mass when the polyamide fiber is fully dissolved, wash the residues with glacial acetic acid of the same temperature, then wash with water of the same temperature, neutralize with dilute ammonia water solution (5.2.2), then wash with water until the residues are neutral when inspected with an indicator. After each washing, vacuumize it and drain the liquid and dry, cool and weigh the residues.

5.5 Result calculation and expression

The result calculation and expression are in accordance with those specified in GB/T 2910.1, and the d value for soybean protein composite fibre is 1.02.

6 Bi-component Mixture of Soybean Protein Composite Fibre and Acetate Fibre (Method Using Acetone)

6.1 Principle

Dissolve and remove the acetate fibre from the sample of known drying mass with acetone, collect, wash, dry and weigh the residues; calculate corrected mass in the drying mass of mixture. Obtain the mass fraction of acetate fibre from the difference.

6.2 Reagents

The reagents specified in GB/T 2910.1 and 6.2.1 of this part are used.

6.2.1 Acetone with the distillation range of 55℃~57℃.

6.3 Apparatus

7.3.1 Conical flask with stopper, of which the capacity is not less than 200mL.

7.4 Test procedures

The test shall be carried out according to the general principles specified in GB/T 2910.1 and the following procedures.

Put the prepared sample into a conical flask, add 100mL of dichloromethane (7.2.1) for each gram of sample, shake the flask to fully wet, and then place for 30min and shake once every other 10 min. Filter the liquid with the sintered glass crucible, add 60mL of dichloromethane to the residues in the conical flask, shake by hands and filter it into the crucible. Wash the residues with a bit of dichloromethane to the crucible and drain the liquid by vacuum suction. Fill the crucible with dichloromethane and drain the liquid by gravity; finally, drain the liquid by vacuum suction. Wash with hot water and dry, cool and weigh the crucible and residual fibre.

7.5 Result calculation and expression

The result calculation and expression are in accordance with those specified in GB/T 2910.1, and the *d* value for soybean protein composite fibre is 1.00.

8 Bi-component Mixture of Soybean Protein Composite Fibre and Wool, Animal Fibre or Silk

8.1 Method using sodium hypochlorite

8.1.1 Principle

Dissolve and remove soybean protein component in wool, animal fibre or silk and soybean protein composite fibre from the sample of known drying mass with 1mol/L sodium hypochlorite solution, collect the residues (polyvinyl formal), wash, dry, and weigh them; calculate the mass fraction of soybean protein composite fibre accounting for mixture drying mass according to the content of soybean protein. Obtain the mass fraction of wool, animal fibre or silk according to the difference.

8.1.2 Reagents

The reagents specified in GB/T 2910.1 and 8.1.2.1 and 8.1.2.2 of this part shall be used.

8.1.2.1 1mol/L sodium hypochlorite solution

Add sodium hydroxide into 1mol/L sodium hypochlorite to make its content be 5g/L. This solution may be titrated with iodometric method to make its concentration be 0.9mol/L~1.1mol/L.

$$K = \frac{r_0}{r_1} \quad \text{.....} \quad (3)$$

For unbleached soybean protein composite fibre, the protein content is 22.48% and K value is 1.29; for bleached soybean protein composite fibre, the protein content is 21.56% and K value is 1.27.

8.2 Method using sodium hydroxide

8.2.1 Principle

Dissolve and remove the wool, animal fibre or silk from the sample of known drying mass with 2.5% sodium hydroxide, collect, wash, dry and weigh the residues; calculate its mass fraction accounting for the mixture drying mass with corrected mass, and obtain the mass fraction of wool, animal fibre silk according to the difference.

8.2.2 Reagents

The reagents specified in GB/T 2910.1 and 8.2.2.1 and 8.2.2.2 of this part shall be used.

8.2.2.1 Sodium hydroxide solution (with mass fraction of 2.5%)

8.2.2.2 Dilute acetic acid solution: dilute 5mL of glacial acetic acid with water to 1000mL.

8.2.3 Apparatuses

The apparatuses specified in GB/T 2910.1 and 8.2.3.1 and 8.2.3.2 of this part shall be used.

8.2.3.1 Conical flask with stopper, of which the capacity is not less than 200mL.

8.2.3.2 Water bath: capable of keeping the water boiling.

8.2.4 Test procedures

The test shall be carried out according to the general principles specified in GB/T 2910.1 and the following procedures.

Put the prepared sample into a conical flask, add 100mL of 2.5% sodium hydroxide solution (8.2.2.1) preheated to nearly 100℃ for each gram of sample, keep the conical flask in boiling water bath for 20min and shake it now and then to fully dissolve the animal fibres like wool; and then filter with sintered glass crucible of known mass, wash the residues with sodium hydroxide solution at the same temperature and concentration for several times, wash with 40℃~50℃ water and neutralize with dilute acetic acid solution (8.2.2.2) successively, and then wash with water to neutrality (inspected with indicator); the liquid must be drained by vacuum suction after each washing. Finally, dry, cool and weigh the crucible and residues.

8.2.5 Result calculation and expression

The result calculation and expression are in accordance with those specified in GB/T 2910.1. The *d* values for unbleached and bleached soybean protein composite fibres are 1.07 and 1.12, respectively.

8.3 Method using nitric acid

8.3.1 Principle

Dissolve and remove the soybean protein composite fibre from the sample of known drying mass with nitric acid solution, collect, wash, dry and weigh the residues; calculate its mass fraction accounting for the mixture drying mass with corrected mass, and obtain the mass fraction of wool, animal fibre silk according to the difference.

This method is not applicable to bi-component mixture of soybean protein composite fibre and silk.

8.3.2 Reagents

The reagents specified in GB/T 2910.1 and 8.3.2.1 and 8.3.2.2 of this part shall be used.

8.3.2.1 5:1 (V/V) nitric acid solution

Add 500mL of concentrated nitric acid (with density at 20℃ of 1.40g/mL) into 100mL of water.

Warning: this reagent is highly oxidative and corrosive, thus, the user shall take perfect protection measures.

8.3.2.2 Dilute ammonia water solution

Dilute 80mL of strong ammonia solution (with density of 0.880 g/mL) to 1000mL with water.

8.3.3 Apparatuses

The apparatuses specified in GB/T 2910.1 and 8.3.3.1 and 8.3.3.2 of this part shall be used.

8.3.3.1 Conical flask with stopper, of which the capacity is not less than 200mL.

8.3.3.2 Water bath: capable of keeping the temperature at 23℃~25℃.

8.3.4 Test procedures

The test shall be carried out according to the general principles specified in GB/T 2910.1 and the following procedures.

Put the prepared sample into a conical flask, add 100mL of nitric acid solution (8.3.2.1) for each gram of sample, keep the conical flask in boiling water bath at 23℃~25℃ for 20min to fully dissolve the soybean protein composite fibre; and then filter with sintered glass crucible

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