Laboratory Report

Burning Test

Date:： ＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

Name： ＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

Class： ＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

Marks： ＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

Objectives

To examine the effect of heat on different fibres or fabrics.

Introduction

The burning of fibre or fabric samples can be used to identify the type of fibre, either ‘thermoplastic’ or ‘non-thermoplastic’ properties. Thermoplastic means fibres melt or soften when exposed to heat.

Materials and Apparatus

1. Materials: 6 samples (6 pieces of yarn each and 10 cm long)
2. Apparatus: alcohol lamp, tongs, heatproof mat, magnifier

Procedures

1. Unwind the sample a little bit.
2. Bring the sample to the flame slowly.
3. Observe any shrinkage or melting.
4. Move the sample over the flame; observe the flammability of the fibre, the size and the colour of the flame, density of smoke and smell.
5. Remove the sample from flame, see whether the sample keeps on burning or not and observe the characteristics of residue.

Precaution

* 1. The test should be conducted in a well-ventilated area.
  2. Keep the area for testing clean and tidy.
  3. Samples should be free from grease or dust before conducting the test.
  4. Store the alcohol lamp properly after use.

Results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name of fibre | Close to flame | Over the flame | Away from the flame | Smell | Residue |
| Wool | Does not melt or shrink | Burns slowly with some shrivelling | Stops burning | Smell of burning hair | Leaving a black crushable ash |
| Cotton | Does not melt or shrink | Burns rapidly | Afterglow, burns to completion | Smell of burnt paper | Fine grey ash |
| Acrylic | Melts and shrinks | Burns and melts with a sotty flame | Continues to burn and melt | Smell of burning meat | Hard and unbreakable black residue |
| Acetate | Melts and shrinks | Burns and melts in a flame yellow flame | Continues to burn and melt | With an acidic smell | Leaving an irregular hard brittle black bead |
| Polyester | Melts and shrinks | Burns and melts | Difficult to burn, may self-extinguish | With a sweetish smell | Leaving an hard black bead |
| Nylon | Melts and shrinks | Burns slowly | Flame diminishes and tends to die out | With a ‘celery’ smell | Leaving a round fawn-coloured bead |

Discussion

Fibres react differently to heat. Most synthetic fibres are thermoplastic. Natural fibres are non-thermoplastic. Cellulose materials burn rapidly and they have afterglow. Afterglow is dangerous as the materials will continue to burn after the flame is gone. Animal hairs, such as silk and wool are flame resistant materials as burning will stop after the flame is gone. Synthetic fibres will stop burning within a short period of time as they melt and drip. Therefore, they are also flame resistant which is similar to animal hairs.

Besides material, fabric construction will also affect flammability. Plain surface fabrics burn slower than raised surface fabrics. The raised surface traps more air and the protruded parts are more flammable. Similarly, fabrics which are constructed loosely may burn more easily than fabrics which are constructed tightly.

Flammability is an important factor in determining the suitability of finished products. Heat setting will permanently change the shape and improve the dimensional stability of fabrics made from thermoplastic fibres. This can be used to create permanent pleats and creases on thermoplastic fabrics. Besides, heat-set fibres, yarns and fabrics are stable at low temperature and may be damaged by high temperature. Cotton and wool are non-thermoplastic but they can be damaged by exposure to excessive heat. Cotton may start to burn and wool will become brittle.

The accuracy of the results of this test may be affected by the number and fibre composition of the yarn and personal subjectivity. The result will be deviated if yarn made of more than one type of fibre is used. Therefore, yarn with only one type of fibre should be used or to separate the yarn into different fibres for different testing.

Conclusion

Flammability of fibres and fabrics is very important for deciding the suitability of a finished product. The properties of fibres, method of fabric construction, thickness of fabrics and fabric finishing can affect the flammability of a finished product. Plant fibres such as cotton and linen are very flammable. Regenerated fibres are also flammable but the burning speed is slower and more time is needed than plant fibres. Animal and synthetic fibres are non-flammable and flameproof. Therefore, when making non-flammable or flameproof textile products, wool, silk and synthetic fibres should be used rather than plant fibres and regenerated fibres. On the other hand, plant fibres have a better comfortability than synthetic fibres. In order to retain the comfortability and reduce the flammability of plant fibres, flameproof fabric finishing could be used.

Reference

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