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“Flame-proofing” Fabric

A textile that is flame resistant or fire resistant does not continue to burn or glow once the source of ignition has been removed, although there is some change in the physical and chemical characteristics.

Most organic fibers undergo a glowing action after the flame has been extinguished, and flame-resistant fabrics should also be glow resistant. Afterglow may cause as much damage as the flaming itself since it can completely consume the fabric. The burning (decomposition) temperature of cellulose is about 230 degrees C, whereas afterglow temperature is approximately 345 degrees C.

Flame Resistance

The flame resistance of a textile fiber is affected by the chemical nature of the fiber; ease of combustion; fabric weight and construction; efficiency of the flame retardant; environment; and laundering conditions.

Fire-resistant characteristics can change significantly when treated fabric is exposed to sunlight, followed by laundering, even though repeated washing and tumble dying of samples of the same specimen does not indicate any significant changes.

Chemicals

There are three types of fire retardants. Non-durable fire retardants consist of water-soluble inorganic salts. These are easily removed by washing or exposure to water. The second type is semi-durable, and can be removed after repeated laundering. Finally, durable fire retardants are not affected by repeated (10 or more) launderings.

There are four theories for fire retardant mechanisms, and these include thermal (reducing the thermal buildup a treated combustible, coating (via an insulating coating that can melt over the fiber, gas (in which nonflammable gases, like water or ammonia, are released), and chemical (in which fire retardance can be "grafted" to natural fiber or actually built into products. Common methods of treating materials would be by water-soluble salt impregnation, a purely physical method of depositing tiny crystals on the fiber surface. There is also vacuum or pressure impregnation and coating ways to treat materials.

Recipes

Because Fire retardant can be expensive, this is a compilation of a few recipes for making fire retardant solutions for use on fabrics that use the method of depositing tiny crystals on the fiber surface.

Formula 1: Borax - 6 parts, 6 lbs, Boric acid - 5 parts, 5 lbs, Water - 100 parts, 12 gallons. Steep fabric in cool solution until impregnated. Heavy applications by spray or brush are usually reasonably effective. Repeat if necessary. This is good for theater scenery fabric, and recommended for rayon and natural fabrics. Yields a 8 - 12 % weighting.

Formula 2: Borax - 7 parts, 7 lbs, Boric acid - 3 parts, 3 lbs, Water - 100 parts, 12 gallons. Water can be varied according to absorptive capacity of fabric. For rayon and sheer fabrics, these same amounts of borax and boric acid can be used with 17 gallons of water. Hand-wring for an 8 - 10% weighting on fabric. Flexibility and softness will be retained without dustiness, and also microorganism growth is prevented.

Formula 3: 1 ounce water glass (sodium silicate), 9 ounces water
Mix well. Wash and rinse article completely before applying this solution. Soak fabric in solution. Hang up to dry. CAUTION: Water glass is caustic to skin and toxic upon ingestion. Wear gloves and handle carefully. As always, keep water glass away from children.

Formula 4: From the National Fire Protection Association
9 oz Borax Powder; 4 oz Boric Acid; 1 gallon of water . Mix thoroughly and spray on or dip. Solution should drip off material.

Caution

Before using any flame-treated fabrics on stage, the material should be tested to make sure that the fabric is indeed flame retardant.

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