

Quadrant II – Notes

Programme: S Y B Sc (Hons) Home Science

Subject: Home Science

Course Code: CC12

Course Title: Introduction to Textiles

Unit: II Production, Chemistry, Properties and Usage of Fibres

Module Name: Polyamide

Module No: 8

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Notes :

Nylon is the name of a family of synthetic polymers that are commonly used to make a variety of different types of apparel and consumer goods. Unlike other organic or semi-synthetic fibers, nylon fibers are entirely synthetic, which means that they have no basis in organic material.

The use of this type of synthetic polymer in clothing began with a desire to find alternatives to silk and hemp for parachutes in World War II. At the time the war began, cotton was used for more than 80 percent of textile applications in the United States, and almost all other textiles were made from wool. By 1945, however, synthetic fibers like nylon constituted around 25 percent of the textile market share, and once the war ended, manufacturers sought new ways to market this new class of synthetic fabrics.

During the early days of nylon fabric, consumers noted a variety of issues with nylon fabric. Despite early marketing efforts that described nylon as "stronger than steel," nylon was found to be highly susceptible to runs and tears, and this fabric's lack of moisture-wicking properties also became a subject of concern. In extreme cases, nylon stockings would revert to coal and water.

Nylon would have been considered to be a failed experiment if producers of this material hadn't started mixing it with other textiles. It was found that when nylon fabric was mixed with polyester, spandex, or cotton, the desirable attributes of this

fabric were retained, but many of the undesirable aspects of this fabric were eliminated. These days, most nylon garments consist of a blend of various fabrics. This fabric remained popular throughout the 1940s and 1950s, but nylon and other synthetic textiles have experienced a steady drop in popularity since the 1970s. Over time, the novelty of nylon started to wear off, and consumers also became concerned about the environmental impact of this fabric. The main ingredient of nylon fabric is petroleum oil, and this textile is not biodegradable.

Even though nylon fabric for consumer garments has declined in popularity, this polymer family has become increasingly popular for industrial and scientific purposes. For instance, nylon can be made into a plastic that is highly durable and versatile, and nylon resins are commonly used in hair combs, machine screws, gun parts, food packaging, toothbrushes, and hundreds of other applications.

Nylon fabric is a polymer, which means that it is composed of a long chain of carbon-based molecules called monomers. There are quite a few different types of nylon, but most of them are derived from polyamide monomers that are extracted from crude oil, which is also known as petroleum.

In most cases, a monomer called hexa methylene diamine is used in the production of nylon, and this substance is sometimes called diamine acid for short. This monomer is extracted from crude oil, and the remaining components of this oil are sometimes used for other purposes, but they may be discarded.

To make the polymer known as nylon, diamine acid is forced to enter into a reaction with adipic acid. This type of polymer is commonly known as PA 6,6, and it was the first type of polymer to be used for nylon fabric. PA 6,6 is a type of substance called a nylon salt, and this crystallized substance is then heated to form a molten substance.

This substance is then extruded through a spinneret, which is a device that looks similar to a showerhead that has dozens of tiny holes. Upon extrusion through the spinneret, nylon immediately hardens, and the resulting fibers are then ready to be loaded onto bobbins.

These fibers are then stretched to increase their strength and elasticity, and they are then wound onto another spool in a process called "drawing." This process causes the polymer molecules to arrange in a parallel structure, and after the drawing process is completed, the resulting fibers are ready to be spun into garments or other forms of fibers.

In some cases, nylon may be spun into fabrics on its own, but it is usually combined with other fabrics to create mixed textiles. It is then dyed to produce the color that is desired for the end product.

There are quite a few chemically different polymer substances that are all called "nylon." Some examples of these types of fabrics include:

- Nylon 6,6: This polymer was one of the first fully synthetic fabrics, and it is formed by combining hexa methylene diamine and a for of dicarboxylic acid. The resulting salt can be melted to form fibers or crystallized for purification purposes.
- Nylon 6: This polymer is sometimes used to make nylon fabrics, but it is less popular for this application than nylon 6,6.
- Nylon 4 6: This type of polymer is only produced by the international corporation DSM, and it is marketed under the name Stanyl. While this polymer isn't commonly used in fabrics, it is known for its resistance to inhospitable environments, and it is commonly found in engine components such as transmissions, brakes, and air cooling systems.
- Nylon 5 10: This polymer was also originally developed by DuPont, and it was intended to be an alternative to nylon 6,6. However, production costs ultimately prohibited the mass production of this polymer for fabric purposes, and it is now primarily used in industrial and scientific applications.
- Nylon 1,6: This polymer is made by mixing adipo nitrile, formaldehyde, and water, but it is not commonly used in fabrics.

Strength: Strongest among all fibres

Elasticity: Very elastic return back to its original shape

Resiliency: Excellent

Abrasion resistance: Excellent

Moisture Absorption: Very low

Chemical properties

Effect of alkalies: No effect

Effect of acids: Damaged by Cold acid

Effect of Sunlight: Poor resistant

Effect of Mildew: Damaged by mildew

Effect of Moths: Damaged by moth