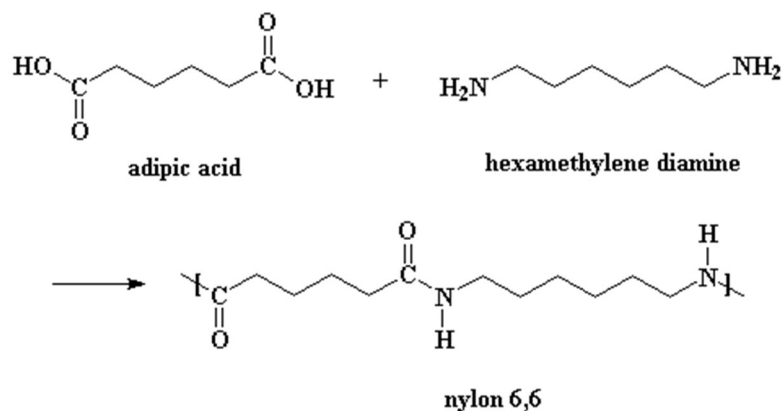


Nylon:- is an artificial fibre, which is one of the most commonly used polyamides and is exceptionally strong, hard and water resistant. Nylons are made up of silky material which was first used in toothbrushes. Polyamides are basically used for synthetic fibres in clothing. Moreover, nylons are often used as a substitute for low-strength metals.

Preparation of Nylon:-

Nylon belongs to a polymer family which is also known as linear polyamides. Nylon for fibre applications can be used in two ways. By the first way, the molecules containing an acidic group (**COOH**) react with molecules consisting of amino (**NH₂**) groups at each end respectively. The nylon produced is assigned a name considering the number of carbon atoms that separate two amines and two acidic groups. Hence, adipic acid and hexamethylenediamine are popularly known for producing fibres such as nylon 6,6.



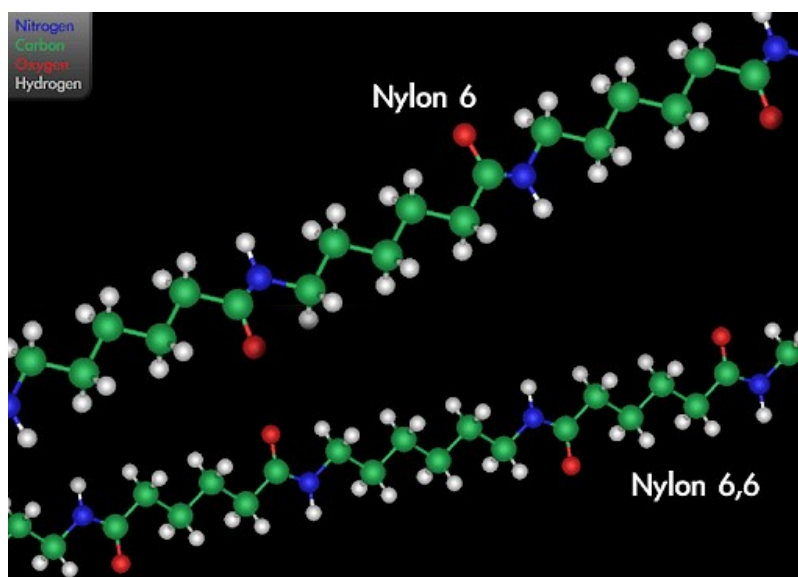
An exact ratio of 1:1 acid to the base is found in the salt formed by two compounds and then this salt is known as nylon. To form the polymer and remove unnecessary water in doing so, we dry the salt under a vacuum.

However, on the other hand, a chain with repeating units of $(-NH-[CH_2]_n-CO-)x$ is produced by polymerizing a compound that contains an amine and acid at opposite ends. If n is found to be equal to 5 then this nylon is named nylon 6, another common form of this polymer. Open-ring polymerization using caprolactam is used for the commercial production of nylon 6. So, technically in both the methods, polyamide is cooled down and then melted and drawn to obtain the desired characteristics for commercial products or daily use.

Types of Nylon:-

There are basically 4 types of **Nylons**.

- Nylon 6 – Paul Schlack synthesized this by forming ring-opening polymerization.
- Nylon 510 – Sebacic and pentamethylene diamine acid are used to obtain this type.
- Nylon 1,6 – Dinitriles along with acid catalysis is used to produce this type.
- Nylon 6, 6 – It was patented by Wallace Carothers with the use of amide.



Uses of Nylon:-

- It is used for making strings of musical instruments and as a thread in bristles for toothbrushes.
- It is used in the synthesis of artificial fibres.
- It is also used to make fishnet.
- In the industries, nylons are used for making Conveyor and seat belts, parachutes, airbags, nets and ropes, tarpaulins, thread, and tents

Properties of Nylon:-

- Nylons are Lustrous.
- They are Elastic and are very strong.
- They are Damage resistant to many oils and chemicals.
- Moreover, they are very Resilient and do not absorb water.

- Nylons dry quickly.
- Their Pleats and creases can endure higher heat temperatures.
- Then, they have a more compact molecular structure and at the same time, have better sunlight and water resistance.
- They feel softer in hand.
- They have a high melting point at 256 °C or 492.8 °F.
- And they are great colour fastness.
- Additionally, they are Excellent abrasion-resistant.
- Nylons can be very lustrous, semi-lustrous or dull.
- They are durable as their high tenacity fibres are used for tire cords, seat belts, ballistic cloth, etc.
- They have high elongation and have made easy-care garments possible.
- Nylons also have a high resistance to fungi, insects, animals, mildew, moulds, rot and various kinds of chemicals.
- These artificial fibres are used for making decorative carpets and stockings.
- Moreover, they do not burn, instead, they melt.
- They are used for making many military-grade applications.
- These polyamides have Good Specific Strengths.
- They are also claimed to be transparent to infrared light (if less than 12 dB).

Advantage of Nylon:-

1)Nylon is broadly in use to make materials from synthetic polymers also known as plastics.

2)Nylon is very helpful for making fishing nets, ropes, parachutes and other types of cables. The particular reason for this is as it is a high resistance fibre.

3)It can be useful to make different types of fabric products.

4)Crinkled nylon is in use to make elastic hosiery.

5)Other nylons may even be in use as plastic to make types of machine components.

Thus, it needs to be mixed with wool to boost power.

6)Nylon is having a long-lasting property. It wears well, that is in clothing and other fabrics is a significant characteristic. Other products such as cotton or spandex can also be mixed with it.

7)Nylon has water-resistant property.

8)Nylon tends to push it to the surface of a liquid and thereby it evaporates more easily.

Rather than absorbing and maintaining moisture like natural fibres, it resists water.

9)Since nylon is a synthetic human-made fabric, not a natural fabric it must be farmed or harvested from livestock i.e., the material is less costly.

10)Although it may not carry the same aura as merino wool or cashmere, for instance, to get a comparable and compatible feeling, nylon can be woven. As a consequence, nylon clothing is less expensive than other products made from similar natural sources.

Disadvantages of Nylon:-

- 1)As nylon is fire-resistant, it easily melts. It can also easily shrink and react with moisture, allowing it to be stretched.
- 2)Nylon is hygroscopic in nature, so even from the air it easily absorbs water.
- 3)Nylon swells and deteriorates rapidly when it gets wet.
- 4)There are many components that should not be subjected to nylon fasteners, which involves sunlight too.
- 5)It lacks UV resistance and becomes yellow regardless of its colour, becoming fragile and rapidly deteriorating.
- 6)Generally speaking, these fasteners of nylon can only withstand a continuous service temperature of 121oF or 223oC.
- 7)Making them unsuitable for machinery or products that are heated when in use, such as those that are used in building.

Industrial Applications of Nylon:-

Nylon, a synthetic polymer, has various industrial applications due to its favorable properties such as high strength, durability, chemical resistance, and low friction. Some notable industrial applications of nylon include:

1. Textiles and Apparel:

- Nylon is widely used in the textile industry for manufacturing fabrics and garments. It is commonly found in stockings, lingerie, raincoats, and sportswear due to its lightweight and durable nature.

2. Automotive Components:

- Nylon is used in the automotive industry for producing various components such as gears, bearings, bushings, and other engine parts. Its high strength and resistance to wear make it suitable for these applications.

3. Industrial Components:

- Nylon is employed in the production of gears, bearings, rollers, and other mechanical components in industrial machinery. Its self-lubricating properties and resistance to abrasion contribute to its use in these applications.

4. Electrical Components:

- Nylon is used in the manufacturing of electrical connectors, insulators, and other components. Its insulating properties and ability to withstand high temperatures make it suitable for electrical applications.

5. Consumer Goods:

- Nylon is used in various consumer goods such as toothbrush bristles, fishing lines, zippers, and luggage. Its versatility and durability contribute to its widespread use in these products.

6. **Packaging Materials:**

- Nylon films and fibers are utilized in packaging materials, providing strength and flexibility. Nylon-based packaging is used in food packaging, industrial packaging, and other applications where a durable and flexible material is required.

7. **Medical Applications:**

- Nylon is used in medical applications for manufacturing surgical sutures and other medical devices. Its biocompatibility, strength, and flexibility make it suitable for these applications.

8. **Sporting Goods:**

- Nylon is commonly used in the production of sporting goods such as fishing lines, tennis strings, and outdoor equipment. Its high tensile strength and resistance to abrasion are valuable in these applications.

9. **Aerospace Components:**

- Nylon is employed in the aerospace industry for manufacturing lightweight components, such as fasteners and structural parts, where high strength-to-weight ratio is crucial.

10. **Construction Materials:**

- Nylon fibers are used in construction materials like ropes and nets due to their strength and durability. Additionally, nylon-based materials may be used in architectural fabrics for tensile structures.

The versatility and wide range of properties make nylon a valuable material in various industrial sectors, contributing to its extensive use in diverse applications.