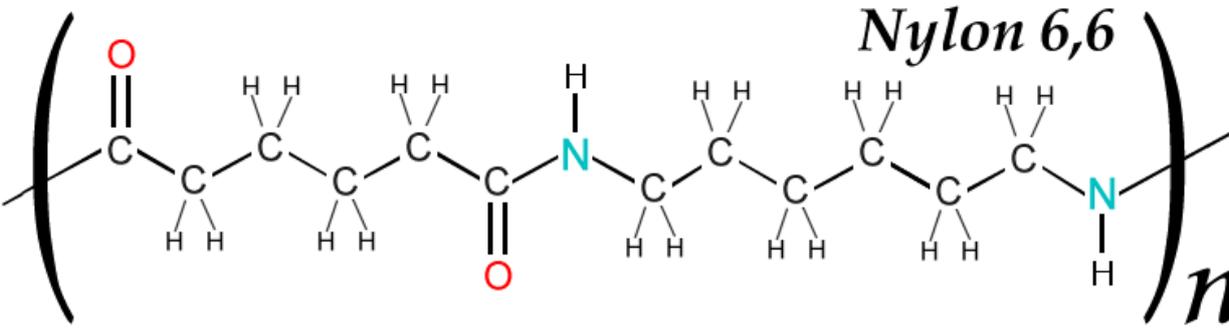


NYLON 6,6 (Nylon 6)

 <p>The diagram shows the repeating unit of Nylon 6,6 enclosed in large parentheses with a subscript 'n'. The structure consists of a chain of atoms: a carbonyl group (C=O), a methylene group (-CH2-), another methylene group (-CH2-), a third methylene group (-CH2-), a fourth methylene group (-CH2-), a carbonyl group (C=O), a nitrogen atom (N-H), a methylene group (-CH2-), another methylene group (-CH2-), a third methylene group (-CH2-), a fourth methylene group (-CH2-), and a nitrogen atom (N-H). The carbonyl oxygens are shown in red, and the nitrogen atoms are shown in blue. The text 'Nylon 6,6' is written in a stylized font above the structure.</p>	
Density	1.15 g/cm ³
Electrical conductivity (σ)	10^{-12} S/m
Thermal conductivity	0.25 W/(m·K)
Melting point	463–624 °K
	190–350 °C
	374–663 °F

Overview:

Nylon is a thermoplastic silky material, first used commercially in a nylon-bristled toothbrush (1938), followed more famously by women's stockings ("nylons"; 1940). It is made of repeating units linked by amide bonds and is frequently referred to as *polyamide* (PA). Nylon was the first commercially successful synthetic polymer. There are two common methods of making nylon for fiber applications. In one approach, molecules with an acid (COOH) group on each end are reacted with molecules containing amine (NH₂) groups on each end. The resulting nylon is named on the basis of the number of carbon atoms separating the two acid groups and the two amines. These are formed into monomers of intermediate molecular weight, which are then reacted to form long polymer chains.

Nylon was intended to be a synthetic replacement for silk and substituted for it in many different products after silk became scarce during World War II. It replaced silk in military applications such as parachutes and flak vests, and was used in many types of vehicle tires.

Nylon fibres are used in many applications, including fabrics, bridal veils, carpets, musical strings, and rope.

Solid nylon is used for mechanical parts such as machine screws, gears and other low- to medium-stress components previously cast in metal. Engineering-grade nylon is processed by extrusion, casting, and injection molding. Solid nylon is used in hair combs. Type 6,6 Nylon 101 is the most common commercial grade of nylon, and Nylon 6 is the most common commercial grade of molded nylon. Nylon is available in glass-filled variants which increase structural and impact strength and rigidity, and molybdenum sulfide-filled variants which increase lubricity.

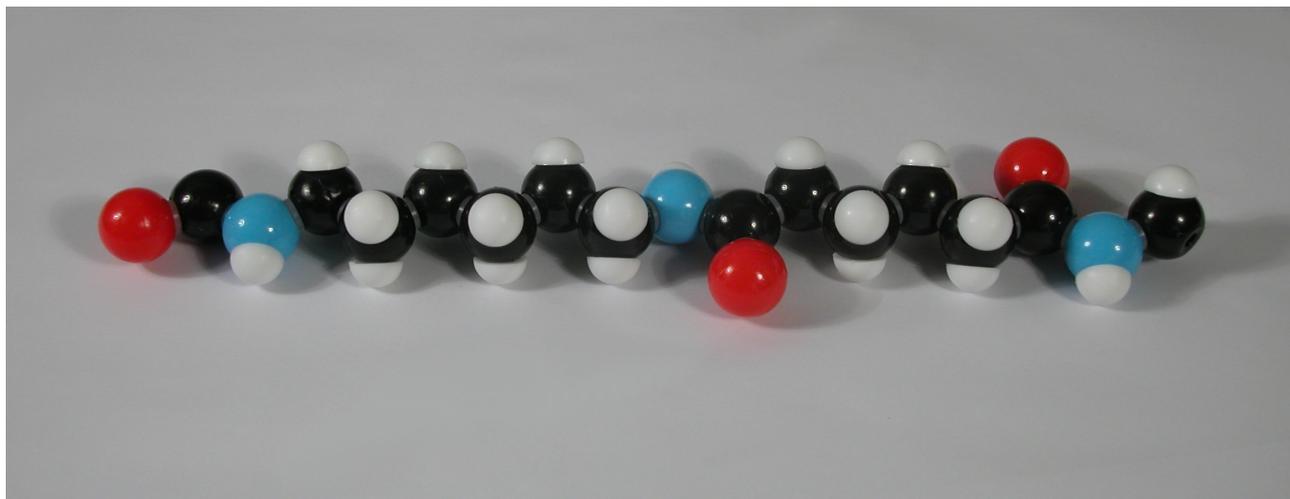
Aramids are another type of polyamide with quite different chain structures which include aromatic groups in the main chain. Such polymers make excellent ballistic fibres.

Nylon 6-6, also referred to as **nylon 6,6**, is a type of nylon. Nylon comes in many types, the two most common for textile and plastics industries are: nylon 6 and nylon 6,6.

Composition:

Nylon 6,6 is made of hexamethylenediamine and adipic acid, which give nylon 6,6 a total of 12 carbon atoms, and its name.

MolecModels3D Nylon 6,6 – Cat.No. 1021048:



Physical properties:

1. Nylon 6,6 has a melting point of 265°C, high for a synthetic fibre, though not a match for polyesters or aramids such as Kevlar. This fact makes it the most resistant to heat and friction and enables it to withstand heat setting for twist retention.
2. Its long molecular chain results in more sites for hydrogen bonds, creating chemical “springs” and making it very resilient.
3. It has a dense structure with small, evenly spaced pores. This means that nylon 6,6 is difficult to dye, but once dyed it has superior colorfastness and is less susceptible to fading from sunlight and ozone and to yellowing from nitrous oxide.

Characteristics:

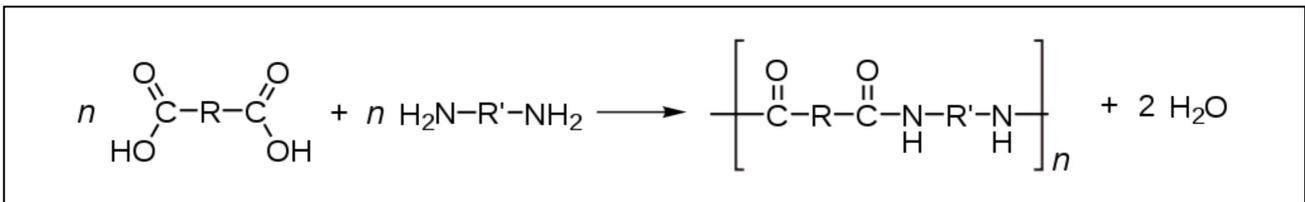
- Variation of luster: nylon has the ability to be very lustrous, semilustrous or dull.
- Durability: its high tenacity fibers are used for seatbelts, tire cords, ballistic cloth and other uses.
- High elongation
- Excellent abrasion resistance
- Highly resilient (nylon fabrics are heat-set)
- Paved the way for easy-care garments
- High resistance to insects, fungi, animals, as well as molds, mildew, rot and many chemicals
- Used in carpets and nylon stockings
- Melts instead of burning

- Used in many military applications
- Good specific strength
- Transparent under infrared light (-12dB)

Manufacture:

Nylon 6,6 is made of hexamethylenediamine and adipic acid, which give nylon 6,6 a total of 12 carbon atoms, and its name.

1. Hexamethylene diamine and adipic acid are combined with water in a reactor. This produces nylon salt. The nylon salt is then sent to an evaporator where excess water is removed.
2. The nylon salt goes into a reaction vessel where a continuous polymerization process takes place. This chemical process makes molten nylon 6,6.
3. The molten nylon 6,6 undergoes a spinning process, where the nylon 6,6 is extruded and sent through a spinnerette, which is a small metal plate with fine holes. The nylon is then air-cooled to form filaments.
4. Nylon's chemical formula is $n\text{HOOC}-(\text{CH}_2)_4-\text{COOH}+n\text{H}_2\text{N}-(\text{CH}_2)_6-\text{NH}_2\text{----}\rightarrow[-\text{OC}-(\text{CH}_2)_4-\text{CO}-\text{NH}-(\text{CH}_2)_6-\text{NH}-]_n+2n\text{H}_2\text{O}$ and the part $-\text{CO}-\text{NH}-$ will stick together becoming Nylon 6,6.



Applications:

1. Carpet fiber
2. Apparel
3. Airbags
4. Tires
5. Ropes
6. Conveyor Belts
7. Hoses

Nylon 6,6's longer molecular chain and denser structure qualifies it as a premium nylon fiber, specified most often by professional architects and designers for use in commercial settings like offices, airports, and other places that get a lot of wear and tear. It is also an excellent choice for residential carpet applications.

Use in composites:

Nylon can be used as the matrix material in composite materials, with reinforcing fibres like glass or carbon fiber, and has a higher density than pure nylon. Such thermoplastic composites (25% glass fibre) are frequently used in car components next to the engine, such as intake manifolds, where the good heat resistance of such materials makes them feasible competitors to metals

Find the difference with Nylon 6:

