

Nylon

Composition:

Nylon is considered a thermoplastic that is made by linking monomers with diamines and diacids via hydrogen bonds. Polyamide is a term that is also used to describe nylon because of the amines that are present in the molecule.¹ Nylon can be mixed with additives to easily change the properties and performance of the material. Because there are different kinds of diamines and dicarboxylic acids, there are many kinds of nylons that can be produced.² Nylon 6, nylon 6/12, nylon 5/10 are a few examples of different nylons based on their different properties. This material is known to have great strength and abrasion resistance. Some nylons, such as nylon 6 and nylon 66, are able to crystallize due to the strong intermolecular forces between the hydrogen and amide groups, and also due to the Vander waals fores between the repeating methylene chains within the molecule.³

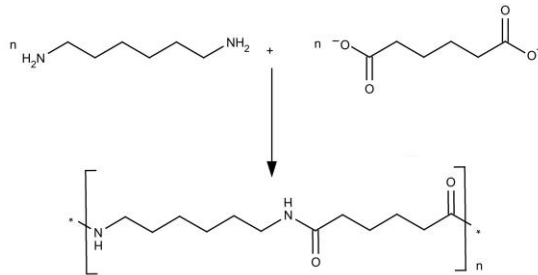


Figure 1: Nylon 6,6. This image shows how a diamine and a dicarboxylic acid synthesize together to form nylon 6,6. The name comes from the six carbon atoms that were given by the diamine and the six carbons that were given by the dicarboxylic acid.²

How it is made:

Nylon is made by reacting monomers with diamines and dicarboxylic acids to produce a long heavy chain.⁴ The monomers of the molecule are synthesized together through a condensation polymerization reaction. When the monomers combine to make the nylon, water is a product of the reaction. If water is left in the reaction, the polymer reaction will cease. It is important that the water is removed if the desired product of nylon is to be strong.¹ The condensation polymerization reaction can make a chain of over 20,000 monomer units water is not present.⁵

Its uses:

With its varying properties, nylon can be used for a variety of things. Nylon was originally made to be an alternative to imported silk.⁴ After a few years, the material became very popular in women's clothing as it was sold as stockings. Now nylon is used for clothing, upholstery and carpet, rope, tents, and even 3D printing.⁴ Nylon powder is used in our lab for selective laser sintering (SLS).

Properties:

Since there are many different nylons, they all have different properties depending on the nylon number.³ For example, the melting point of nylons tend to decrease as nylon number increases.³ The melting point of nylon 6 is lower than nylon 66. The elasticity of nylons is very good which allows them to return to their original length.² Nylon is a synthetically made plastic which makes it very resistant to mold and insects. This material is also weather proof because water molecules cannot easily insert itself into the surface of nylon.² Nylon powder is used in our lab over other options because of its high tensile strength.

References

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