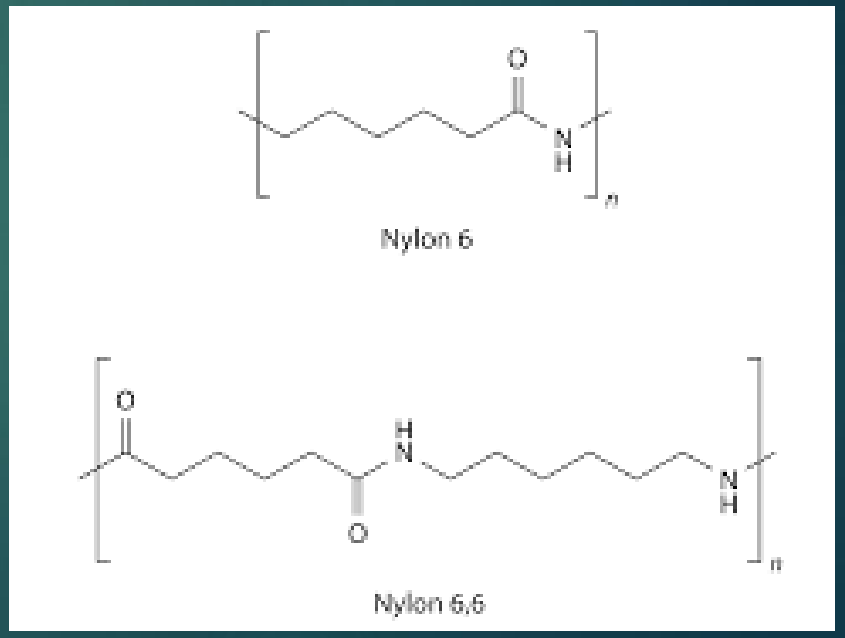
MANMADE FIBRES

NYLON 6 AND NYLON 6,6

POLYAMIDES



2. NYLON

- Is the world's first fully synthetic fibre.
- Its synthesis does not involve any natural raw material.
- Developed by the US Scientist **Wallace H. Carothers** and his associates.
- In the year 1930 ,It was produced from coal, air, water and agriculture by product.
- **PROPERTIES OF NYLON:-**
- Very strong .
- Stronger than the steel wire of same thickness .
- Shiny, soft, smooth and elastic fibre.
- Lightweight and easy to wash.
- Easily dyed in different colours .
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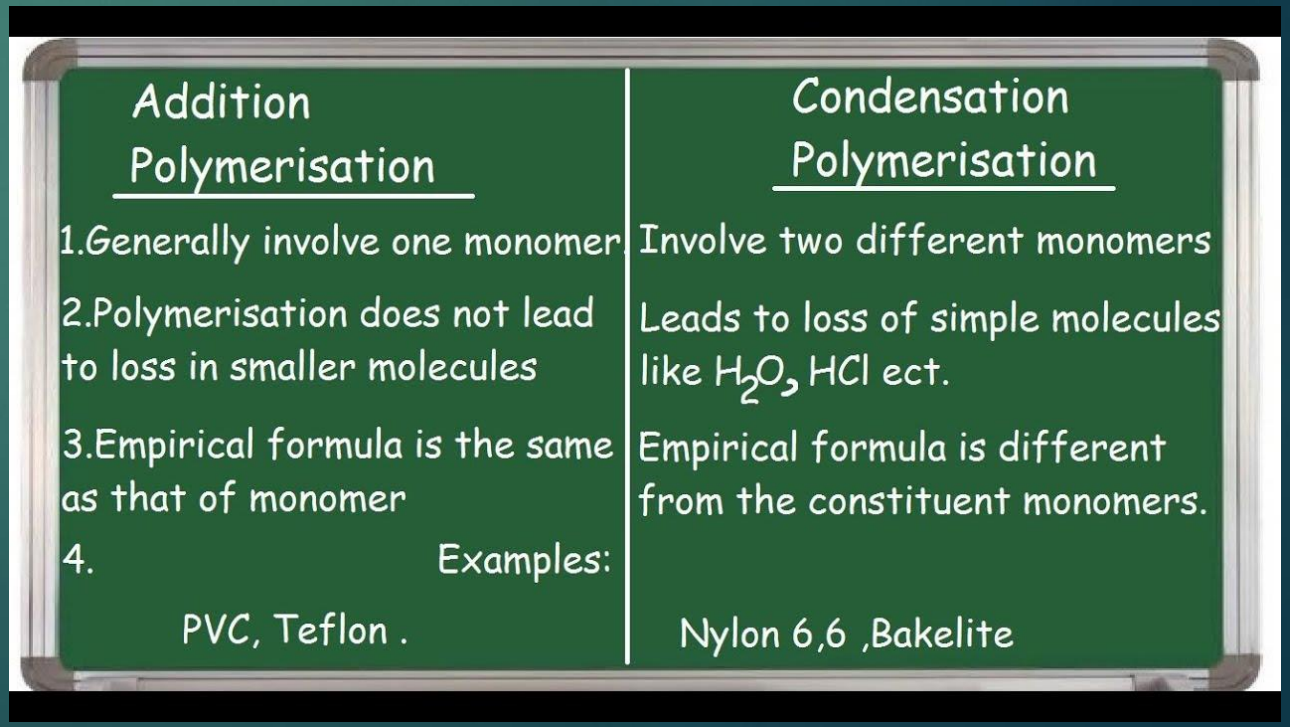
What are polyamides?

- Polyamide fiber are synthetic fiber consisting of amide linkages. Polyamide fibres include nylons.
- Nylon is a thermoplastic amide polymer.
- Invented in 1935 by DuPont chemical engineer Wallace Carothers and first used for toothbrush bristles, nylon is the most used synthetic fiber.
- The two variations of nylon used today are nylon 6,6 and nylon 6. With essentially the same final product, the difference between these two is how they are made.
- 6 and 6,6 denote the number of carbon atoms present in the fiber.

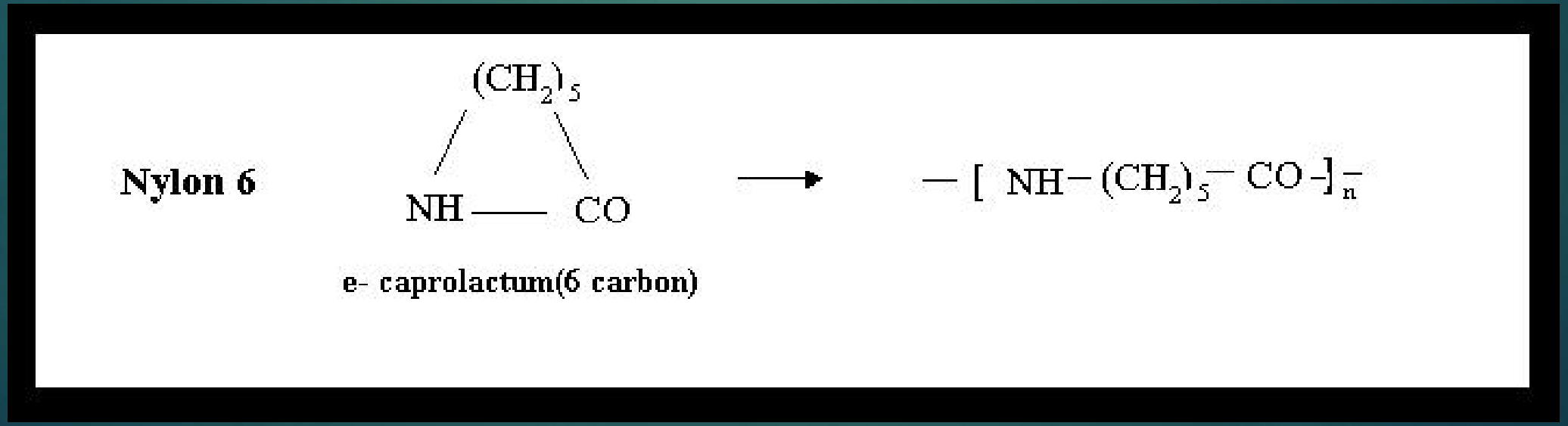
Polymerisation

- **Polymerisation is a process through which a large number of monomer molecules react together to form a polymer.**
- **The macromolecules produced from a polymerization may have a linear or a branched structure.**
- **It is of two types :- Addition polymerization and condensation polymerisation**



Manufacturing Process of Nylon 6

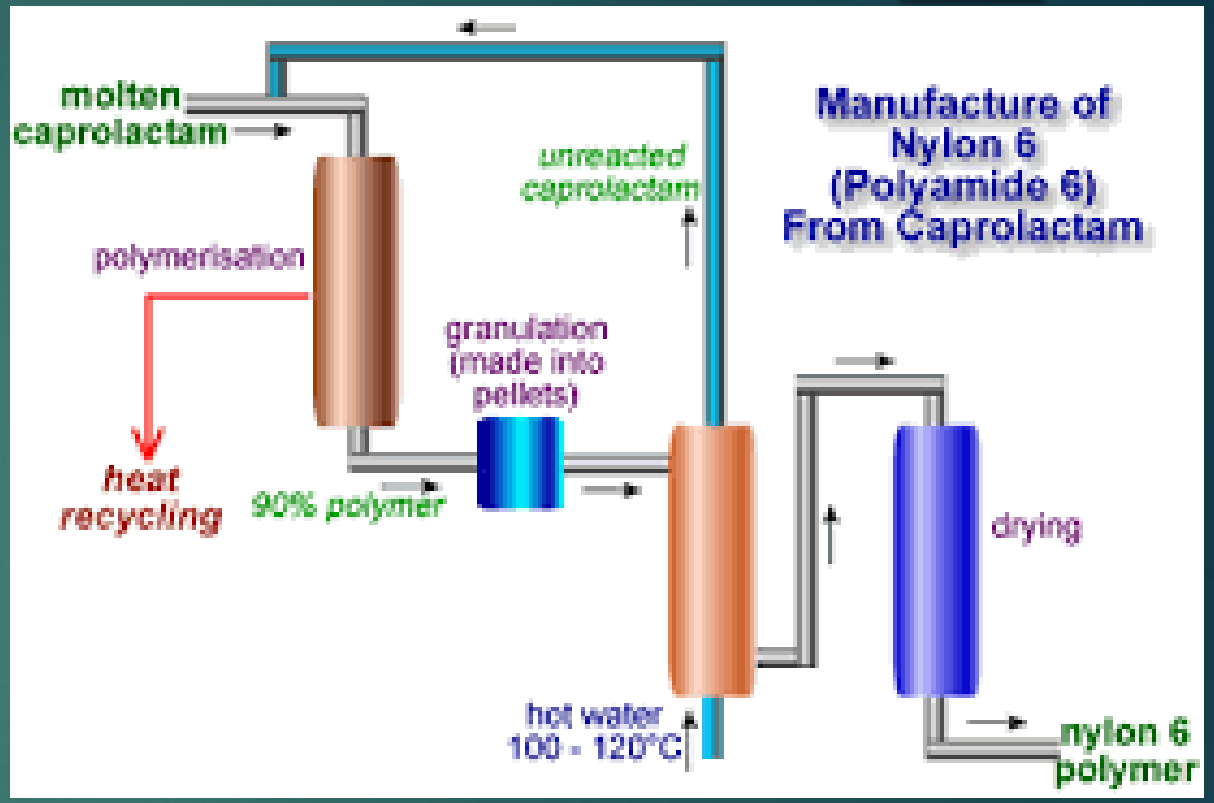
- Nylon Manufactured in India at present is of this type. This is made from Caprolactum which is made by a series of reactions using products obtained from coal tar



- Caprolectum is a white flaky solid, melting at 68degree celsius and is soluble in water. The polymerisation is carried out in stainless steel cylinders.

  Hot Caprolectum is mixed with a suspension of pigment, acid promotor and acid chain stopper. The extent of polymerisation depends upon the temperature of polymerisation. The purpose of acid chain stopper is to stop furthur polymerisation so that a desired density of molten polymer may be obtained.

  The molten polymer is extruded into ribbons and cut into chips. These chips are used for the production of continuous filaments.



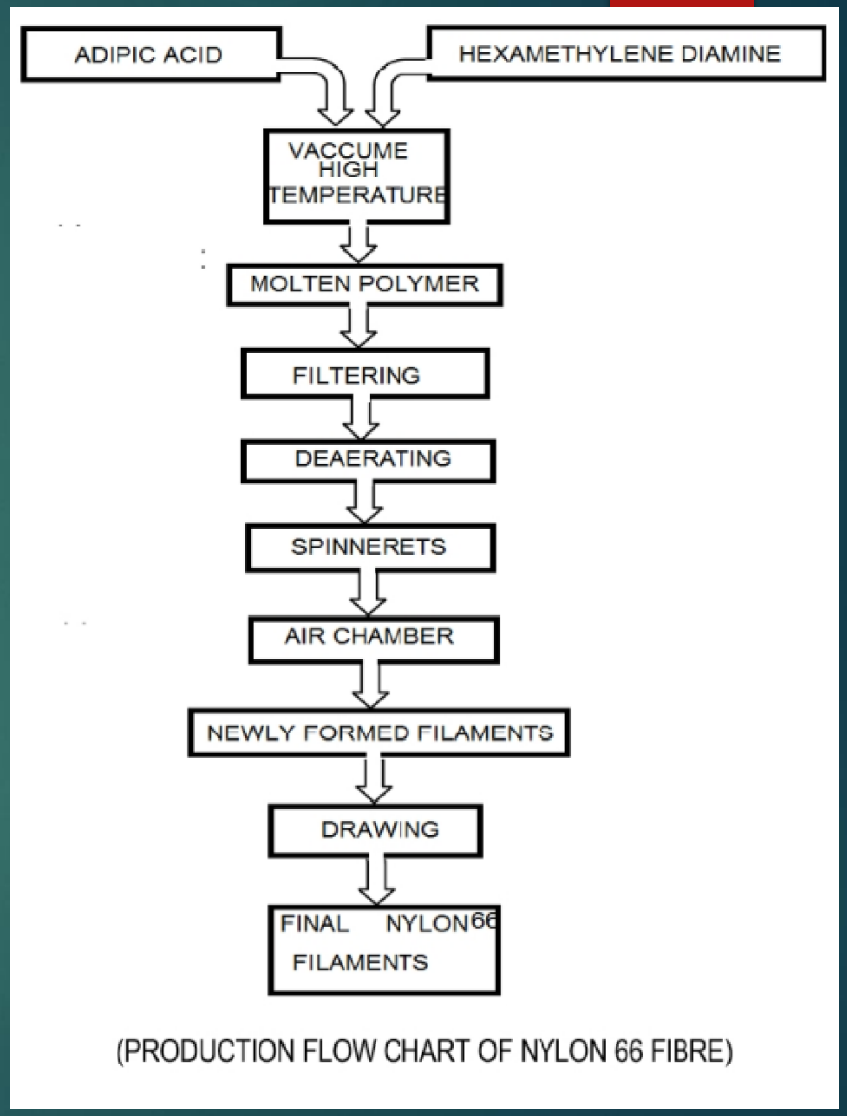
Melt Spinning

- Continuous filaments are made by melt spinning. Dry polymer chips are fed to a melt spinning apparatus where they are heated electrically to 250-260 deg C.
- The molten polymer flows into a conical section to form a pool, which feeds a spinning pump and spinnerette.

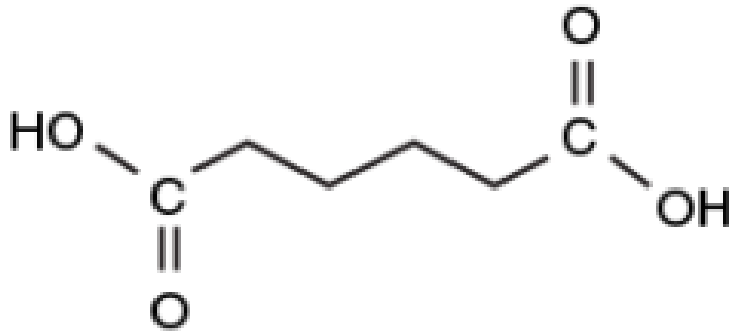
  The molten polymer leaving the pump is filtered before entering the spinnerette which is a stainless steel disc having a number of holes, the number and diameter of which determine the type of yarn formed.
- The yarn thus formed is not strong enough and has a very high extensibility. the yarn contains a large number of macro molecules which are unoriented and these must be oriented so as to lie parallel to the length of the fibre to develop full strength. This is done by stretching the yarn to 3-4 times its original length.

NYLON 6,6

- Nylon 6,6 is made from Hexamethylene diamine and adipic acid as shown in the figure below.



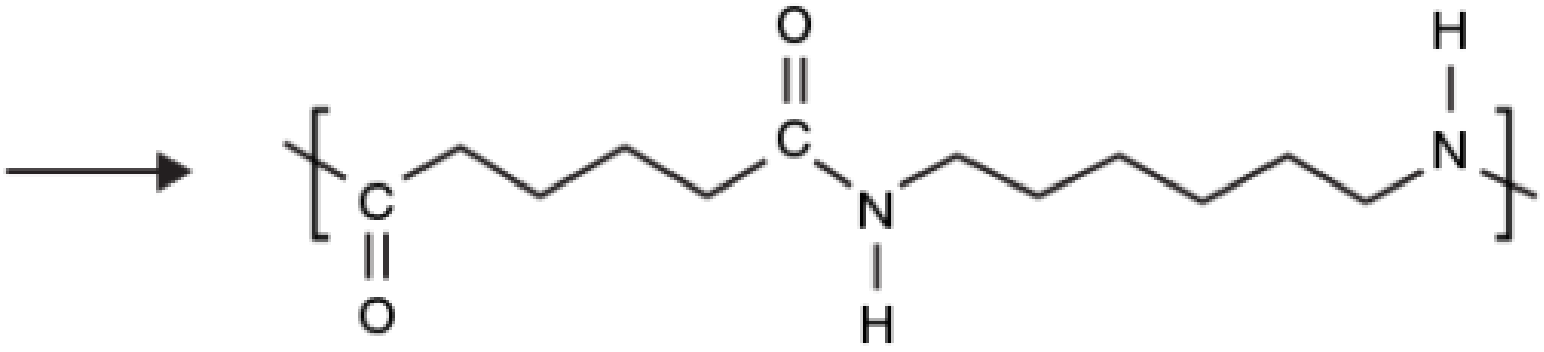
(PRODUCTION FLOW CHART OF NYLON 66 FIBRE)



adipic acid

+

Hexamethylene diamine



Nylon 6, 6