

POLYMER FORMULATION

Polymers

A lot of everyday items are made from polymers.



A polymer can be thought of as resembling numerous beads on a string. Each monomer, or bead, is linked (bonded) to the next to form chains composed of thousands of atoms in a row. It is the huge size of polymer chains that gives the molecules many of their special properties.

ABOUT FORMULATIONS

A material containing a polymer with various additives, modifiers and colour pigments is a formulation.

These formulations have specific properties in order to fulfil the specific application needed.

Activity

Materials

Teflon Plumbers tape (PTFE thread seal tape)

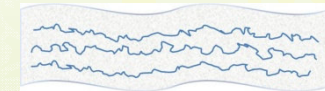
Scissors

Permanent marker

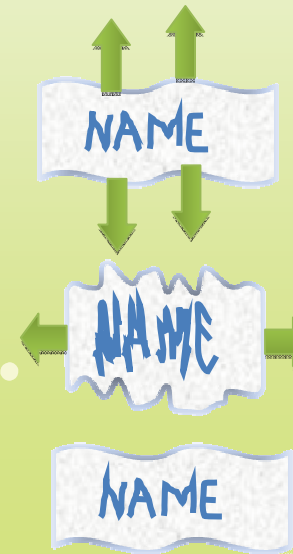
Procedure

- 1 Cut a piece of plumber's tape about 8 to 9 cm long. Use a permanent marker to write your name on the tape.
- 2 Increase the width of the tape by pulling gently along the two long parallel sides. As you pull, the tape will widen and wrinkle. It helps to leave the two original ends undistorted as easy pull tabs. Note: do not pull the tape too far apart because the tape will rip apart.
- 3 Observe the written name. It is distorted and very hard to read.
- 4 Gently pull the 2 narrow ends of the tape. The tape will return to its original shape and your name will once again be readable.

PTFE stands for polytetrafluoroethylene or Teflon. The polymer strands in the Teflon tape are parallel in alignment to the "long" sides



When you pull, as in step 2, the strands slip longitudinally over one another and your name appears distorted. If the strands are pulled too far apart, the chains spread out and the attraction between the chains breaks so the tape is torn. If you have not torn the tape, when you pull the two short ends of the tape in step 4, the polymer chains return to their original parallel orientation.



Instant Snow Polymer

When water is added to this granular white powder, it instantly expands to 40 times its original volume, producing a snow-like material. Its sodium polyacrylate, the 'diaper' polymer!

Materials

Instant Snow Powder
Distilled water
Ziptop bags

Procedure

- 1 Add one teaspoon of the polymer to a ziptop bag.
- 2 Add 40-50 mL of distilled water to the bag and observe the results.
- 3 After drying, the material will return to its original condition and can be used again.



Instant Snow Polymer is made by cross-linking molecules of the sodium polyacrylate polymer. When water is added, the individual clusters internally hydrate and expand, forming small, fluffy clusters that do not cling to surrounding clusters. This appears as a powdery snow. When more water is added, the water molecules hydrate the external surface of these clusters, and the clusters begin to adhere to one another. This appears as slush.

Extensions

Observe the difference between using tap water and distilled water.

Add a little table salt to the hydrated polymer and observe the results.

Look at the clusters. Do they resemble snowflakes? Remember snowflakes have hexagonal shapes due to hydrogen bonding.

What happens if you freeze Instant Snow?

Formulation
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