



Polymer Activity from the:

AMBASSADORS

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## Atlanta NSTA "Make and Take" Activity: April 2004

### Teflon Plumber's Tape

**Grades:** Middle to High School

**Science Standards:** Content Standard B: Physical Science; Content Standard E: Science and Technology

**Background:** 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. The arrangement of the long polymer strands can influence the behavior of a given material. The strands can be randomly oriented and resemble cooked spaghetti on a plate. They can also be aligned so that they are more parallel in position to each other. The behavior of aligned strands can be observed in the following activity.

#### Materials:

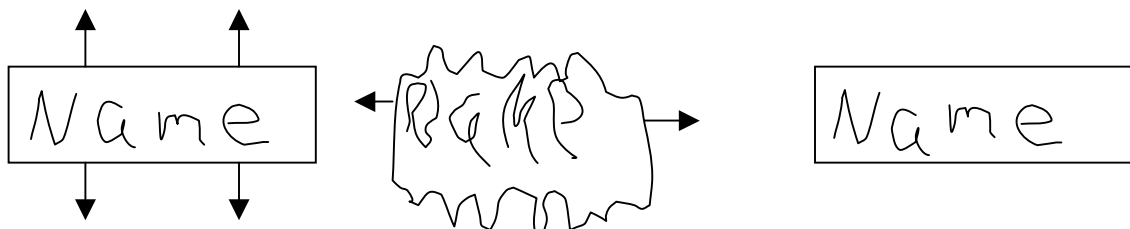
Teflon Plumbers tape (PTFE thread seal tape)

Scissors

Permanent marker

#### Procedure:

1. Cut a piece of plumber's tape about 8 to 9 cm inches 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 along parallel lines.
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.



### Discussion

PTFE stands for polytetrafluoroethylene or Teflon  $\text{-(CF}_2\text{)}_n\text{-}$

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 parallel to the horizontal edges. The bonding between the carbon atoms in the chain is much stronger than the attraction between the chains so that is why the tape tears in the lengthwise direction. 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.

**Reference:** Bob Becker, *Chem 13 News*, November 1994.

Contributed by Sandy Van Natta, Ohio Polymer Ambassador

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**Polymer Ambassador Web Site:** [www.polymerambassadors.org](http://www.polymerambassadors.org)