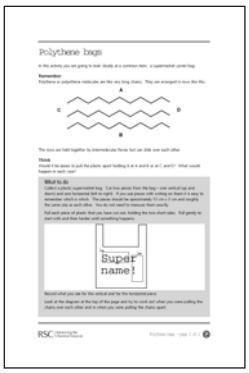
Polythene bags



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2 sheets

This is a quick 10 minute activity which could be used at the end of a lesson on polymer structure or as a review at the beginning of the next lesson. Students think about the orientation of polythene molecules and the implication for the properties of plastic bags. The activity could also be set as a practical homework exercise, although students do find it helpful to discuss their ideas.

Equipment required

For each group of students:

- At least $^1/_4$ of a plastic bag. Supermarket carrier bags are the best.
- Scissors.

Running the activity

Make sure students have thought about the structure of polymer chains or recap the relevant ideas if this is being used as a 'starter' activity. Less able students may find a class dissusion prior to the activity helpful. Pulling the plastic to bits only takes a few seconds.

Answers

Students should draw diagrams of what they have observed.

1. If the chains are pulled over each other the plastic is more likely to stretch.

Note: It is important to make sure students understand that the molecules move over each other but do not themselves stretch. The chains do unravel first but the idea that the molecules stretch when the plastic stretches is a common misconception and students who believe this will not understand the topic.

2. The horizontal piece of plastic.

3. Stretching occurs from C to D.

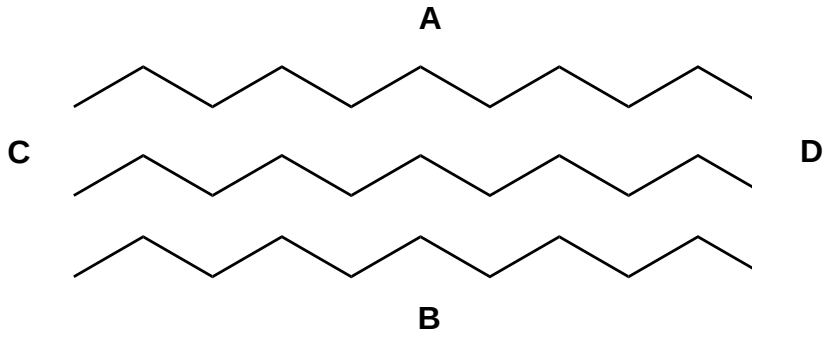
4. Carrier bags are all likely to be produced with the polymer molecules aligned horizontally, otherwise if you put heavy shopping in them they would quickly stretch and break. If they are produced in this way, they are much stronger in the vertical direction as the molecules are held together by intermolecular forces. These ideas could be tested by trying a larger sample of plastic bags from a number of different stores.

Polythene bags

In this activity you are going to look closely at a common item: a supermarket carrier bag.

Remember

Polythene or poly(ethene) molecules are like very long chains. They are arranged in rows like this:



The rows are held together by intermolecular forces but can slide over each other.

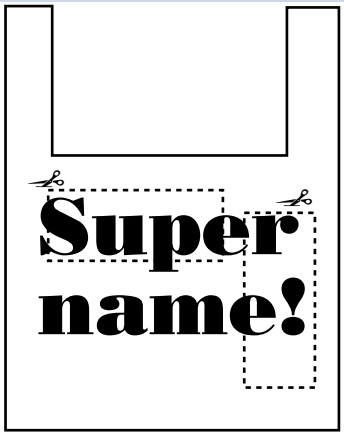
Think

Would it be easier to pull the plastic apart holding it at A and B or at C and D? What would happen in each case?

What to do

Collect a plastic supermarket bag. Cut two pieces from the bag – one vertical (up and down) and one horizontal (left to right). If you use pieces with writing on them it is easy to remember which is which. The pieces should be aproximately 10 cm x 3 cm and roughly the same size as each other. You do not need to measure them exactly.

Pull each piece of plastic that you have cut out, holding the two short sides. Pull gently to start with and then harder until something happens.



Record what you see for the vertical and for the horizontal piece.

Look at the diagram at the top of the page and try to work out when you were pulling the chains over each other and in when you were pulling the chains apart.

Questions

1. When you pull the chains over each other are you likely to stretch or break the plastic?

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2. In which piece of plastic could the chains have been moving over each other when you pulled?

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3. Look at the diagram at the top of the page overleaf. Does the plastic stretch from A to B or C to D?

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4. Do you think the polymer molecules are the same way round in all carrier bags? Explain your answer. What could you do to test your ideas?

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