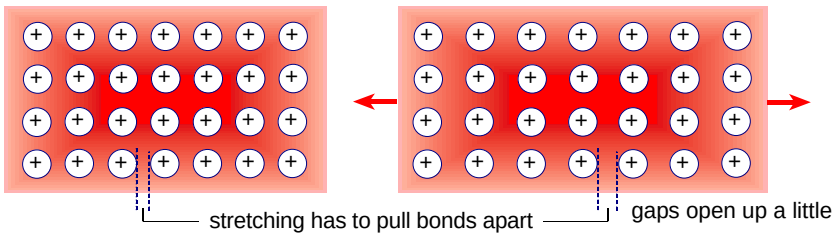
TAP 227- 3: Explaining stiffness and elasticity

Explaining stiffness and elasticity

Metals



a metal is an array of positive ions bonded by negative electron 'glue'

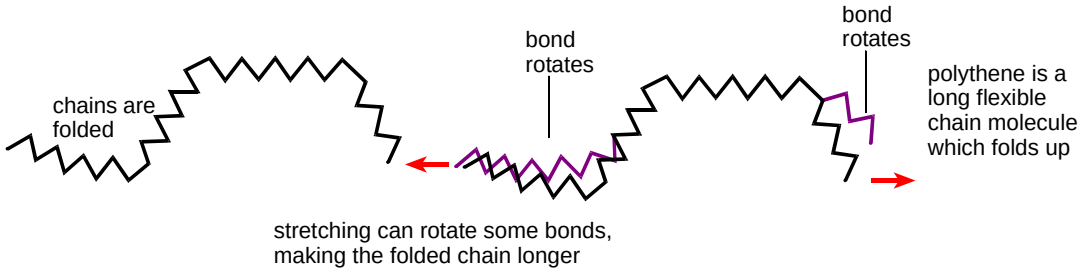
Elastic extensibility ~ 0.1%

Young modulus ~10^{11} — 10^{12} Pa

Stretching a metal stretches bonds — but not much.

Explaining stiffness and elasticity

Polythene



Elastic extensibility ~ 1%

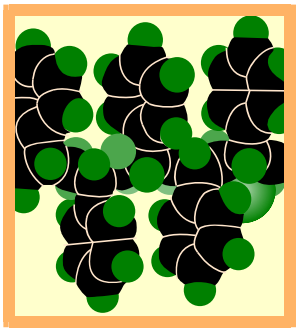
Young modulus
~10^8 — 10^9 Pa

Stretching polythene rotates bonds

Explaining stiffness and elasticity

Stiffer polymers

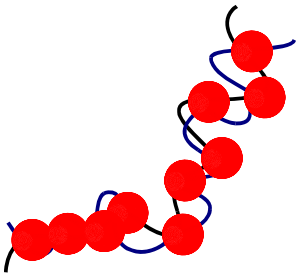
Polystyrene



Polystyrene has benzene rings sticking out sideways. They make chain rotations difficult.

Young modulus
~10^9 — 10^{10} Pa

Bakelite – a thermoset



Bakelite has massively cross-linked chains. The cross-links stop the chains from unfolding.

Young modulus
~10^{10} Pa

Practical Advice

That stretching polythene rotates bonds is worth talking about here.

External References

This activity is taken from Advancing Physics Chapter 5, 190O