

Nutty Putty Film

This demonstration shows the properties of smart materials called non-Newtonian fluids, in particular silly putty.

Year groups: 7-9 (ages 11-14)

Educational objective

To demonstrate the properties of non-Newtonian fluids.

Running time approx. 3 mins.

Key student learning

- Viscosity is a measure of how thick or resistant to flow a liquid is.
- Most liquids have a fixed, or consistent, viscosity. Non-Newtonian fluids are different.
- Non-Newtonian fluids are special types of fluid that naturally act like a viscous liquid but harden on impact. This is known as shear thickening.
- Non-Newtonian fluids behave like a liquid and a solid.

Notes on using the films in the classroom

When you are showing the films to the class, for example on an interactive whiteboard, consider pausing the film at various intervals to involve and extend your students, e.g.

- What do you think will happen next?
- Why has that happened?
- What chemical reaction has occurred? How would we write that?
- You may want to consider relating the demonstration to examples of work you have done in the class. If you prepare the materials in advance you could even get your students to conduct the demonstration alongside the film (see Safety information).

Try this in the classroom

Materials needed

- Silly putty
- Play dough or salt dough
- Hammer
- Safety goggles
- Safety screen

Method

1. Put on your safety goggles and set up your safety screen.
2. Position the play dough, then whack it with the hammer.
3. Replace the play dough with silly putty, then hit this with the hammer.

Safety information

Make sure that you use a safety screen and wear goggles and appropriate protective clothing while conducting this experiment. For detailed safety information contact CLEAPSS.

Discussion

How do you think each material will react when hit with the hammer? Why?

- Do the materials react as you thought? Why/why not?
- Does the silly putty react like anything else you have seen?
- What happens if you slowly pull the silly putty? How about when you pull it apart quickly?

Extensions

- Try experimenting with other non-Newtonian fluids such as cornflour and water in a ratio of 3:2, otherwise known as goop or oobleck (a term invented by children's author Dr Seuss). What happens if you try to roll it into a ball, throw it in the air, heat or vibrate it? See also the Newton's Nemesis film.
- A famous non-Newtonian fluid experiment uses custard (traditionally made with cornflour). A bowl of runny custard will go solid when punched and this action allows you to run across the surface of a paddling pool full of custard.

Links to everyday life

Body armour

Non-Newtonian fluids such as the new material d30 are ideal for body armour because they are flexible, giving the wearer a full range of movements. However, when wearers are subjected to an impact such as a heavy fall, a knife stab or even a bullet, the material becomes solid and protects them. This technology has applications in fields from sports (such as skateboarding and snowboarding) to the military.



Skateboarder, 20 November 1978.

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Curriculum links

Key Stage 3

This activity encourages practical enquiry skills in the area of 'Chemical and material behaviour', specifically:

- Varying solubility
- Link behaviour and nature of materials to particle structure
- Changes of state - solid, liquid, gas
- Explanation of the different physical properties of each state

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