

Custard

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Acknowledgements

This resource was originally developed by the University of Reading to support outreach work delivered as part of the Chemistry for All project.

To find out more about the project, and get more resources to help widen participation, visit our Outreach resources hub: rsc.li/3CJX7M3.

Learning objectives

By the end of this session, you will be able to:

- Explain what a non-Newtonian fluid is.
- Describe conditions where powders may become explosive.

Newtonian fluids

- Newtonian fluids are those that follow Newton's laws of physics.
- The properties of Newtonian fluids are the same as we would expect them to be based on the normal properties of solids, liquids and gases.
- For example, when a person jumps into a pool of water, they sink straight away, rather than float.

Non-Newtonian fluids

- Non-Newtonian fluids do not demonstrate the normal behaviour we would expect based on the properties of liquids.
- Viscosity is a measure of thickness. A liquid with a high viscosity is very thick and does not pour easily.
- Newtonian fluids cannot change their viscosity no matter how you change the amount of pressure or stress on the fluid.
- However, the viscosity of a non-Newtonian fluid can change depending on the conditions they are in.

Career link

Consumer products technician

Watch the video career profile of a consumer products technician, available from rsc.li/3HR7C31 and **slide 15**. Robert is a consumer products technician and uses his understanding of materials, such as non-Newtonian fluids, to develop desirable properties for consumer products, including cosmetics, adhesives and cleaning products.

Activity 1: custard slime

Equipment

- Glass beaker
- Metal spoon or spatula
- 25 ml measuring cylinder
- Tap water
- Mass balance
- 25 g custard powder
- Tray

Safety and hazards

To avoid cuts from broken glass do not apply excessive pressure to the glassware when mixing or experimenting with the custard slime.

If you take the slime out of the container, please keep it in the tray provided. You will be expected to clean up any mess you create.

Do not eat or drink while in the lab and remember to wash your hands at the end of the session.

To do

1. Measure 25 g of custard powder into the beaker using the mass balance.
2. Measure 15 ml of tap water using the measuring cylinder.
3. Add the water to the custard in the beaker and mix them until you have formed a paste.
4. If the mixture does not form a paste, add more water drop by drop until it does.
5. Play with your slime – experiment with mixing, rolling it into balls and pushing it sharply.

To answer

(a) What does your custard slime feel like when you stir it? Is it acting like a Newtonian fluid or a non-Newtonian fluid?

(b) What happens when you stop stirring the custard slime? Is it acting like a Newtonian fluid or a non-Newtonian fluid?
