



# CAPTIVATING CORNFLOUR

As consumers we are able to easily identify products based on their image as well texture. The food industry is a massive global industry, and like all other industries it has to ensure the products being produced have the right image and texture. During the production of many liquid based foods, including soups, sauces, gravies and custard, cornflour is added. Cornflour is powdered white starch extracted from maize kernels and it is added to thicken liquid foods because of its distinct fluid properties.

Fluids can be separated into Newtonian and non-Newtonian fluids. Normal fluids, such as water, which have a constant viscosity and take the shape of the container in which they are poured into are known as Newtonian fluids. On the other hand the viscosity of non-Newtonian fluids changes when a shear stress or force is applied.

Cornflour exhibits the properties of a shear thickening fluid. The viscosity of shear thickening fluids (also known as dilatants) increases as the applied shear stress increases, such as being squeezed or pulled apart.

## EXPERIMENT

We are going to make a cornflour-water mixture and observe how the mixture changes under different conditions. Before starting the experiment write down what you think the answers will be to questions a, b, c and d.

### Equipment

- Beaker
  - Stirring rod
  - Cornflour
  - Water
  - Balance
  - Measuring Cylinder
1. Measure out 15g of cornflour using the balance and pour it into the beaker
  2. Measure out 12 cm<sup>3</sup> of water using the measuring cylinder.
  3. Add the water to the beaker of cornflour.
  4. Stir the cornflour-water mixture, and answer the following four questions:
    - a. What happens when you stir the mixture slowly?
    - b. What happens when you stir the mixture quickly?
    - c. Can you scoop some of your mixture out and role it into a ball?
    - d. What happens when you stop stirring the mixture?

## FURTHER THOUGHTS

The faster you stir the mixture, the more viscous the mixture becomes and although you can role the mixture into a ball, as soon as you release the pressure on the ball the ball collapses. Why does this happen?

Chemical engineers have to understand the different properties of fluids in order to design and develop successful processes. The type of fluid will determine the best way in which the process should be designed. For example in order to mix viscous non-Newtonian low speeds and specific impellers are used.

The nature of non-Newtonian fluids makes them very interesting and useful. One possible use of non-Newtonian fluids is in light weight body armour. Scientists are currently looking at coating materials with a layer of shear thickening fluid. While this armour would be able to stop bullets, a slow moving knife could pierce through the armour.

Non-Newtonian fluids like cornflour are fascinating stuff. Check out the following video for another demonstration of a shear thickening fluid: <http://bit.ly/1PEVY7f>

