

Discover Smart Materials



Shear thickening materials (D30)

Viscosity is a property of a fluid that describes how easily it flows. Low viscosity fluids (such as water) flow easily and higher fluids (such as honey) flow more slowly.



Stretch slowly

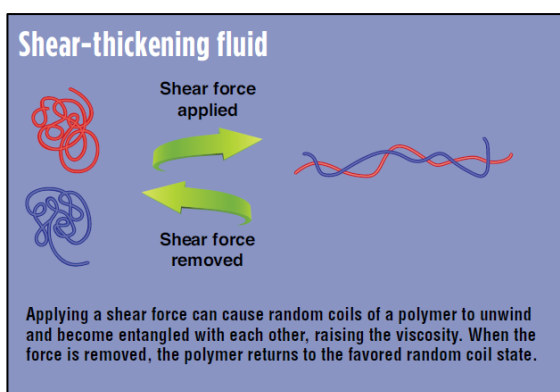


Stretch rapidly

D30 can flow easily (low viscosity) when stretched gently (low strain rate*) BUT get very stiff when suddenly stretched (a high strain rate*). This behaviour is known as a 'non-Newtonian fluid'.

D30 is a polymer so is made of long, entangled molecules (a bit like spaghetti). When this material is stretched slowly, the polymer molecules slowly slide over each other and stretch. If they are stretched rapidly the polymer chains do not have time to disentangle and so they are more brittle and can snap.

This type of material is fantastic at absorbing shock and is used in **personal protective equipment**, such as elbow and knee protectors.



<https://www.acs.org/content/acs/en/education/resources/highschool/chemmatters/past-issues/2016-2017/february-2017/no-hit-wonder-d3o.html>

Shear thickening can be demonstrated by mixing corn flour (cornstarch) with water. Spoon can easily be drawn through this mixture slowly but gets stuck if you attempt to drag it through quickly.

Learn more

- Find out more about Newtonian and non-Newtonian fluids: <https://youtu.be/1mQ-AEP6xWw> (<10 mins long)
- Find out how D30 can be used in crash helmets: <https://youtu.be/GThAxgaWRMo> (< 6mins long)

The future is what you make it...

...but it is also what you make it out of

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