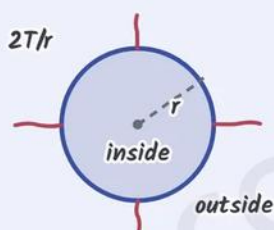


the chemistry behind cleaning, building and preserving the things around us

Soaps and detergents

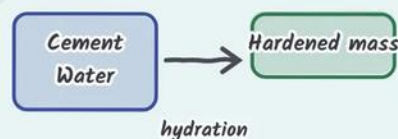
- soap is the sodium or potassium salt of a long chain fatty acid, made by heating a fat or oil with an alkali
- that process is saponification, and it also yields glycerol as a by-product
- a soap molecule has two ends: a long hydrocarbon tail that mixes with grease and an ionic head that mixes with water
- in water the molecules gather into a micelle, tails inward around the grease and heads facing out, and the grease leaves with the rinse
- hard water contains calcium and magnesium ions, which react with soap to form an insoluble scum instead of a lather
- detergents work in hard water, because their calcium and magnesium salts stay soluble, which is exactly why they were developed



soap molecules gathered around a droplet of grease, every tail buried in the oil and every head facing the water outside: the grease is held in the middle of the cluster and carried away when the water is poured off

Cement and glass *

- cement is made by heating limestone with clay in a kiln and grinding the product with a little gypsum
- the gypsum slows the setting, without which the cement would harden too fast to be worked
- setting is a chemical reaction with water, called hydration, and not simply drying out
- that is why concrete is kept wet for days after pouring, a process called curing, so the reaction can complete
- concrete is cement with sand and stone, and reinforced concrete adds steel rods, which supply the tensile strength concrete lacks
- glass is made by melting sand with soda and limestone, and it is not a true crystal but a very slowly flowing solid



cement and water on the left and the set solid on the right: this is a chemical change and not evaporation, which is why the mixture must be kept damp while it happens rather than allowed to dry out