Periodic graphics

A collaboration between C&EN and Andy Brunning, author of the popular graphics blog Compound Interest

More online

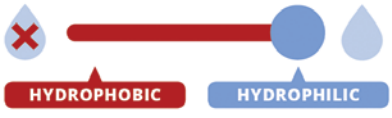
To see more of Brunning's work, go to **compoundchem.com.** To see all of C&EN's Periodic Graphics, visit **cenm.ag/periodicgraphics.**

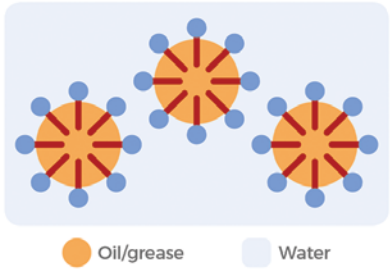
SOAP VERSUS BODY WASH

Soap and body wash both clean in the same way but use different substances to do so. Here, we take a look at the chemical similarities and differences between the two.

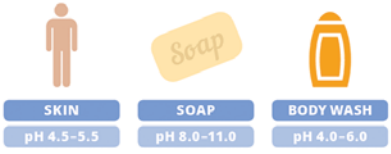
COMMON CHEMISTRY

Soaps and body washes contain surfactants. These are molecules with one end that dissolves in water (hydrophilic) and another that dissolves in oils and grease (hydrophobic).





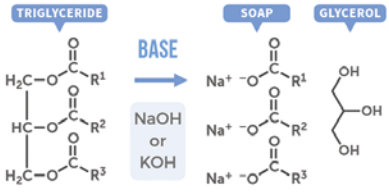
Surfactants lower the surface tension of water, creating foam, and emulsify oils and grease so they can be washed away.



Skin pH is slightly acidic. Soap is alkaline and can have a drying effect, while body washes have a pH closer to skin's.

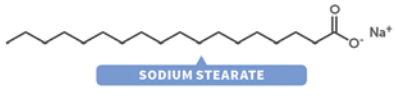
SOAP

Reacting fats or oils (triglycerides) with water-soluble bases generates soap surfactants and glycerol, a useful by-product.



R^1, R^2, R^3 = chains containing 15–19 carbons

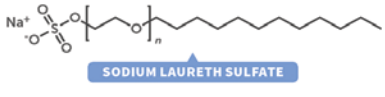
Using sodium hydroxide as the base creates solid soaps, such as sodium stearate. Using potassium hydroxide creates liquid soaps.



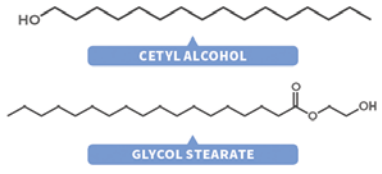
Hard water plus sodium stearate creates soap scum (calcium and magnesium stearates).

BODY WASH

Body wash and shower gels often use salts of lauryl sulfates and laureth sulfates as primary surfactants.



Cetyl or stearyl alcohol additives can give body washes an opaque appearance. Glycol stearate produces a pearlescent effect.



PERIODIC GRAPHICS