

Periodic Graphics

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

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Brunning's work, go to
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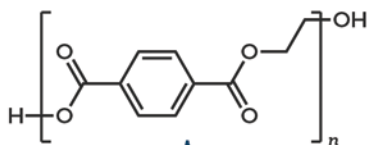
The materials science of swimwear



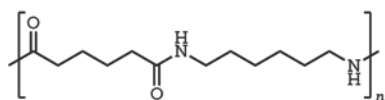
Hitting the swimming pool this summer? Swimwear relies on a range of materials to keep you comfortable and prevent it from breaking down. Here's how it works.

Swimsuit polymers

Modern swimsuits are made from a range of synthetic polymers. Manufacturers commonly use polyesters and nylon.

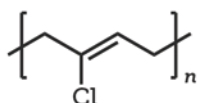


Polyethylene terephthalate (a polyester)



Nylon 6,6

Swimsuit fabrics commonly include elastane (spandex) for stretchability. Neoprene is used in wet suits and dry suits as an insulating material.



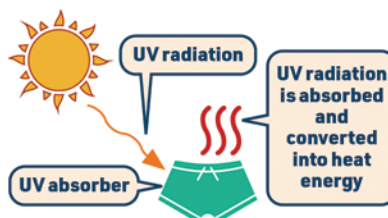
Neoprene

Competitive swimsuits made from polyurethane are banned worldwide by swimming authorities. These suits produce extra buoyancy by trapping air, giving swimmers an unfair advantage.



Sunlight resistance

Nylon and some other synthetic polymers used in fabrics slowly degrade when exposed to ultraviolet radiation from the sun. Manufacturers often add UV absorbers to fabrics to prevent this.



UV absorbers absorb UV radiation, preventing it from generating free radicals, which break bonds in polymers. Inorganic pigments such as titanium dioxide or organic compounds such as benzophenone derivatives can serve this role.

The effect of chlorine

We add chlorine to pools, commonly in the form of hypochlorite salts, to kill bacteria and viruses. But the hypochlorous acid that acts on pathogens can also damage your swimwear.

Sodium hypochlorite



Hypochlorous acid

Over time, hypochlorous acid attacks the polymer fibers in swimsuits, damaging them and reducing the fabric's elasticity. Some fibers are more resistant to chlorine than others. Polyesters degrade less readily than nylon and elastane.



Rinsing swimwear thoroughly in cold water and then drying it in the shade is the best way to prevent the breakdown of the polymer fibers. Avoid machine washing, tumble drying, and bleaching.

