Material World: Crash Course Kids #40.1

Physical Science
https://youtube.com/watch?v=tGfLhPslEjQ
https://nerdfighteria.info/v/tGfLhPslEjQ

[intro plays]

Sabrina: Humans are great, aren't they? I mean I know I'm biased being one myself and all but humans have been responsible for creating some pretty amazing materials. Materials like the ones that are in the computer or the tablet that you might be watching me on right now, and we're inventing brand new materials all the time. Hey humans, keep up the good work!

But what about materials that have already been invented? Can we do anything to improve those, and if so, how?

[text: Big Question]

Well you know I don't like to answer a big question without a quick recap first. Before we talk about improving materials, let's recall what a material is. Simply put: a material is an object that's made of matter, and all materials have properties. Properties are... anybody? Anybody? OK fine, I'll remind you. Properties are the qualities of a certain kind of matter, like it's color, shape, size, temperature or weight. So, properties help describe materials. For example, this desk is an object made of matter, so it's made of a material. It's brown, medium size, weights maybe a couple of kilograms... those things I just listed are the desk's properties. Got it? Great.

I'm going to answer the first part of our big question a little early and tell you yes, humans can improve existing materials. In fact, there's a whole branch of science devoted specifically to studying the properties of materials and how to make them better. Scientists who do this sort of thing are called... you'll never see this coming: material scientists. Humans have been improving existing materials for a long time, since at least the 11th century.

Back then, some early material scientist discovered that the widely used material of iron could be improved. They found that by heating iron in a furnace with charcoal, they could turn iron into a different material we still use to this day. You might have heard of it, it's called steel. Iron's great and all, but steel was a major improvement back then because it was a harder, less malleable metal than iron, and that made for better weapons and tools. Our ancestors really liked weapons... and tools. They liked tools too.

So now that we know we can change existing materials to make them better and more usable, let's take a look at how that happens. Maybe this time with a more modern example. Let's see how a material that we use all the time can be altered and improved. In animation form of course.

[text: investigation]

Say hi to little Sabrina. Look at her tiny cute cell phone. Part of little Sabrina's cell phone is covered in a material you should be familiar with: glass. When cell phones were invented, glass coverings were applied to their screens to protect them, but as newer, better cell phones were invented, newer, better glass began to be used in our phones. The piece of glass that covers little Sabrina's screen now is not the same kind of glass that would have covered her screen in the late 1990's.

This sheet of glass on the left is the kind of glass that covered older cell phones, think phones that came out before the first iPhone. The sheet on the right looks identical to the sheet on the left, right? But it's not. It's something called gorilla glass, which is on little Sabrina's current cell phone and covers most phones today. So they look the same, but how did this become this? If you're thinking gorillas have something to do with making this glass, you're about to be real disappointed.

Material scientists looking to develop tough, scratch-resistant glass for people like me who drop their phone all the time, decided to give original glass... well, a bath. They dip the less strong crack-prone glass in a hot solution of potassium. The solution's extreme heat causes larger potassium particles in the solution to replace smaller particles of sodium in the glass. This exchange of particles changed the properties of the original glass, giving it more strength and making it less likely to crack. In the end, the bath gave scientists, and little Sabrina, gorilla glass.

[text: conclusion]

So the original material, the regular strength glass, was improved when its properties were changed. Which means: yes, humans can improve existing materials when they change the material's properties. This change can occur by adding new substances to a material like the potassium particles in the glass, or by taking away some of its original substances like the sodium particles. And this change in substance also changed the material's properties. So, to the scientists who invented gorilla glass: I and all of the other phone-droppers out there give you our deepest thanks.

[endscreen]