

## **Applications of Materials Science in Clothing**

Clothes are our primary interface with the world and are a prime current and future area for applying advances in materials science! Could any of these materials enhance science concepts in your science curriculum?

**related standards:**

**Investigation and experimentation, all levels!**

Samples of each of these materials are available at the “Inventables.com” store! (including the materials in the display “conductive Velcro and cloth”)

### **Super Absorbent Fibers**

Sodium polyacrylate is a polymer well known for its ability to absorb up to 200 times its mass in water. It is used in a wide variety of commercial and industrial product but is perhaps best known as “diaper polymer. This is a more recently developed fiber form which adds to its versatility in applications for clothing!

*ACTIVITY: SNOW POLYMER AND SUPER ABSORBANT FIBERS*

### **Temperature sensitive cloth**

Thermochromatic materials change color once certain temperatures are reached and revert back to their original color when they return to temperature. This cloth is an example of a “leuco dye” (other thermochromatic materials such as mood rings use liquid crystals). Leuco indicator dyes interact with salts dispersed through the cloth which are only accessible to the dye when a solvent melts at a critical temperature. When this reaction takes place the dye’s absorption spectrum shifts dramatically!

Advancements in infusing liquid crystals into materials have made even glass and ceramics thermochromatic! (see demo)

*ACTIVITY: “CHROMYX” CLOTH AND “MOVING COLORS” MATERIALS*

## **Suction cup tape**

This is a truly reusable and “non-sticky” tape! It has thousands of microscopic suction cups which create many tiny vacuums between the tape and surface. It works best on smooth surfaces - if it gets dirty and tired its surface can be cleaned using traditional tape.

*ACTIVITY: SUCTION CUP TAPE USES AND EXPLORING ITS SURFACE*

## **Non-slip surface**

Silicone is a very useful material – this is an example of a very soft, dimpled elastomer with a very high coefficient of friction. Uses include shoes... or ?

*DEMO: THE LIMITS OF NON-SLIP SURFACE*

## **Nitinol Motors**

Nickel Titanium alloy wire (nitinol) is a great example of material science in action. Recall that we explored nitinol as part of our “Making Stuff” exploration of shape memory alloys last year! Here is a device that can lift MANY times its own weight by harnessing the shape memory properties of nitinol.

*DEMO: NITINOL “MEMORY WIRE” LINEAR ACTUATOR MOTORS*