JESSICA HARROP: Hi, I'm Jessica. And I'm going to be talking about a chemical demonstration today that I like to call let it snow. MIT's Dr. John Dolhun-- here he is-- and his assistant, Arielle, are going to perform two magic tricks involving super absorbent polymers. Let's watch as they show us the first one at the Cambridge Science Festival.

[WHOOSH]

JOHN DOLHUN: And what I'm going to do is I'm going to pour some water into the beaker that she's holding. And you keep your eyes on the beaker. Bring it down just a bit. Hold it firmly. Turn it to-- we are making snow. We're making snow today, Arielle.

ARIELLE LUBIN: Oh, boy. It's so cold and wet. It's just like real snow. Look!

[WHOOSH]

JESSICA HARROP: So what happened? Well, Arielle was holding a beaker containing some sodium polyacrylate, which is a polymer. Now a polymer is a big molecule that's a chain of repeating units. This is the unit. And this is what it looks like in a chain.

Now, different chains are held together by cross links. The et cetera just means that this could be thousands of carbons long. This is just a small part of the chain and the polymer. Now when water is added to the polymer, it wants to rush into the material because of the presence of so many sodium and carboxylate ions.

The water displaces the sodium ions leaving negatively charged carboxylic ions. These repel each other and the repulsion causes the polymer, which starts out wound together, to unwind, swell, and stretch. The cross lengths, which connect the polymer chains together, prevent them from breaking apart in the water. And the fake snow that's created is the same snow they use in Hollywood movie sets. Now, let's watch Dr. Dolhun and Arielle turn this same polymer into something totally different.

[WHOOSH]

JOHN DOLHUN: OK, so I've got another beaker she's holding. And I'm going to pour some water in it and observe. Turn it over, Arielle. You don't have to hold your hand under the hole.

That's the same polymer. Only this time the polymer is not as cross-linked as the first one. It's more of the straight chain polymer. And it can absorb many more times its weight in water. You'll recognize this. This is the diaper polymer. You know now, right?

[WHOOSH]

JESSICA HARROP: So Dr. Dolhun uses the same polymer with a different amount of cross linking. The sodium polyacrylate that makes diaper gel has fewer cross-links and therefore can absorb more water than the sodium polyacrylate that turned into snow. Overall, this polymer can absorb up to 800 times its own weight in distilled water and about 30 times its own weight in urine. It's the main ingredient in baby diapers used to keep the baby dry.

[MUSIC PLAYING]

Hope you enjoyed the video and I'll see you next time.