

# 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**.

## WHAT IS PLAY-DOH MADE OF?

Children have been playing with Play-Doh for 65 years. Hasbro closely guards the exact ingredients of commercial Play-Doh, but here we look at the key chemical components that make the material act the way it does.



### WATER AND STARCH

Water and starch are the main components of Play-Doh. The material usually contains wheat flour, which has a starch that is approximately 25% amylose and 75% amylopectin.



Adding warm water to starch granules makes them swell and gelatinize because of hydrogen bonding between water molecules and the sugar molecules in starch.

### RETROGRADATION INHIBITOR

Adding extra amylopectin to the mixture prevents retrogradation, or hardening, which occurs when amylose molecules crystallize.

### SALT

Salt reduces starch's water of hydration and prevents mold growth. The salt can be sodium, potassium, or calcium chloride.

### LUBRICANTS AND SURFACTANTS

Amylopectin added to prevent retrogradation makes Play-Doh sticky. Lubricants, like mineral or vegetable oil, and surfactants, such as polyethylene glycol esters, reduce stickiness.



### PRESERVATIVES

Preservatives, like calcium propionate, sodium benzoate, parabens, or borax, can prevent microbial growth.

### FRAGRANCES AND PIGMENTS

Fragrances, including vanilla, improve the smell of Play-Doh, and pigments produce vibrant colors.

