

# Periodic graphics

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

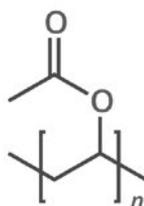
More  
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To see more of  
Bunning's work, go to  
**compoundchem.com**.  
To see all of C&EN's  
Periodic Graphics,  
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## THE CHEMISTRY OF GLUE

It's back-to-school season, which means it's time to stock up on classroom supplies, including glue. Here, we examine what gives some of the main types of these adhesives their stickiness.

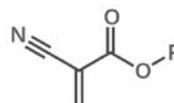
### PVA GLUE



POLY(VINYL  
ACETATE)

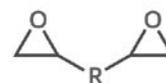
PVA glue, commonly referred to as Elmer's glue in the U.S., is a solution of poly(vinyl acetate) in water. The poly(vinyl acetate) dries into a solid mass as the water evaporates, sticking objects together.

### SUPERGLUE & EPOXY GLUE



CYANOACRYLATE

R = alkyl group

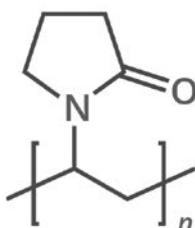


DIEPOXIDE

R = various groups

Superglue is made of cyanoacrylates, which form polymer chains when they react with a small amount of water from the air. Epoxy glues consist of an epoxide resin (above right) and a hardener, typically a polyamine. When mixed, a copolymer forms. Both of these glues gain extra strength from cross-links between their polymer chains.

### GLUE STICKS

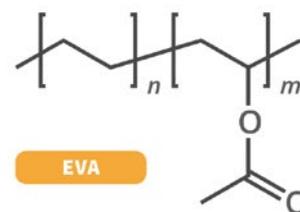


POLY(VINYL-  
PYRROLIDONE)

Many glue sticks previously used petroleum-derived poly(vinylpyrrolidone) in combination with a soap gel to get the glue to stiffen.

Sustainability concerns mean some manufacturers have now switched to using plant-starch-based adhesives in the sticks.

### GLUE GUNS



EVA

Glue guns melt a thermoplastic adhesive with a heating element. The most commonly used polymer in hot-melt adhesives is a copolymer of ethylene and vinyl acetate (EVA). The adhesive also contains tackifiers, waxes, and stabilizers. For stronger, higher temperature glues, manufacturers include a range of other polymers, including polyurethanes and polyamides.

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