Periodic Graphics

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

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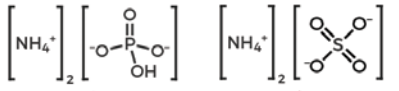
To see more of Brunning's work, go to **compoundchem.com.** To see all of C&EN's Periodic Graphics, visit **cenm.ag/periodicgraphics.**

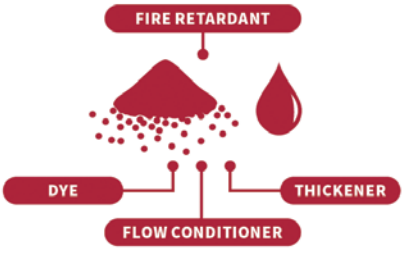
SUPPRESSING WILDFIRES WITH CHEMISTRY

Planes dumping large amounts of red powder are a common sight during wildfires. Here we examine what's in the powder, its safety, and how it helps halt forest fires.

WHAT'S USED?

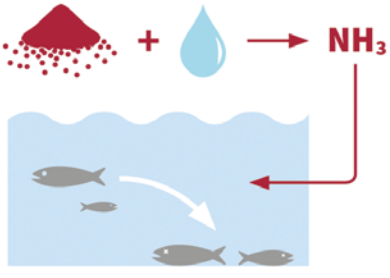
The commonly used fire retardant to combat the spread of wildfires is Phos-Chek. The powdered form contains ammonium phosphates (one shown) or sulfates as the active ingredient, and the liquid form contains ammonium polyphosphates.





Other ingredients include gum-based thickeners, which hold the cloud of retardant together as it's applied from the air. Flow conditioners allow the powder to be easily transferred and mixed. The red color of Phos-Chek, which aids air crews in applying it, derives from iron(III) oxide or a nonpermanent, light-sensitive dye.

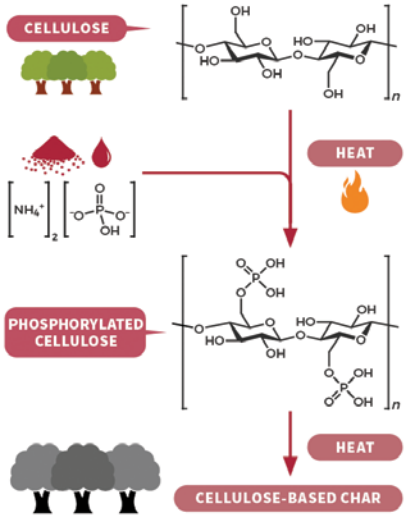
IS IT SAFE?



Reports have indicated only minor incidents of skin and eye irritation for humans. Phos-Chek, however, can be hazardous to aquatic organisms, as ammonium phosphates dissociate in water to form ammonia. As a result, delivery is avoided near streams.

HOW DOES IT WORK?

Applied to vegetation before a fire, phosphate salts react with cellulose in the organic matter, forming phosphate esters. Heat decomposes these esters, forming a protective char that slows the spread of wildfires.



After a fire has passed, ammonium compounds in the retardant can act as fertilizers, aiding forest regrowth. But scientists are concerned that they may also enhance invasive species.

PERIODIC GRAPHICS

CREDIT: SHUTTERSTOCK (PHOTO)