

Periodic Graphics

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

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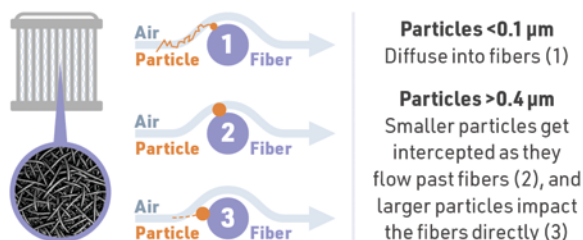
To see more of
Brunning's work, go to
[compoundchem.com](https://www.compoundchem.com).
To see all of C&EN's
Periodic Graphics,
visit [cenm.ag/
periodicgraphics](https://cenm.ag/periodicgraphics).

AIR PURIFICATION TECHNOLOGIES

The COVID-19 pandemic has renewed interest in air purification systems. Here we look at the different technologies used in these systems and how they combat airborne viruses.

HIGH-EFFICIENCY PARTICULATE AIR (HEPA) FILTERS

HEPA filters use polypropylene or fiberglass fibers to trap particles. To be certified HEPA, the filters must remove 99.97% of 0.3 μm diameter particles from the air. Clinical evidence demonstrates that HEPA filters reduce viral infections in hospitals.



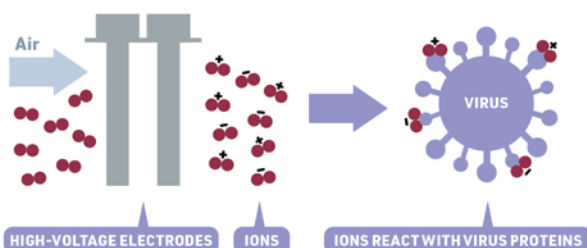
ULTRAVIOLET C (UVC) LIGHT

UVC light causes bases in DNA and RNA to fuse, deactivating viruses. The same chemical mechanisms can damage human DNA and RNA. But far-UVC light (222 nm) is safer because dead skin cells absorb it before it reaches living cells. UVC lights in ventilation ducts can deactivate airborne viruses.



BIPOLAR IONIZATION

Some air purifiers use high-voltage electrodes to ionize molecules in the air. These ions react with proteins on virus surfaces, preventing the viruses from infecting cells. There's little research on this method's effectiveness outside the lab, and ionization can generate ozone, which irritates airways.



PHOTOCATALYSIS

Shining UV light onto some materials, such as titanium dioxide, releases electrons and leaves behind positively charged holes. Molecules in the air react with the electrons or holes to generate reactive oxygen species, which damage the molecules that make up viruses.

