



USING AIR PURIFIERS TO CONTROL AIRBORNE VIRUSES IN SCHOOLS – Recent Experience in the United States with “Emerging Technologies”

A CAUTIONARY TALE

May 2022

Schools in the USA got over \$140 billion to address the COVID-19 pandemic. This led to massive marketing efforts by purveyors of air cleaner technologies, and associated controversy and litigation.¹ This centered around technologies described by US CDC and ASHRAE as “**emerging technologies**”.

The following information on such technologies from the ASHRAE EPIDEMIC TASK FORCE is taken from its recent summary document on Filtration and Disinfection.² This includes the following advice from the CDC.

CDC Position on Emerging Technologies for Air Cleaning



CDC does not provide recommendations for, or against, any manufacturer or product. There are numerous technologies being heavily marketed to provide air cleaning during the ongoing COVID-19 pandemic. Common among these are ionization, gaseous hydrogen peroxide, and chemical fogging disinfection. Some products on the market include combinations of these technologies. These products generate ions, reactive oxidative species (ROS, which are marketed using many names), or chemicals into the air as part of the air cleaning process. People in spaces treated by these products are also exposed to these ions, ROS, or chemicals.

While variations of these technologies have been around for decades, relative to other air cleaning or disinfection methods, they have a less-documented track record when it comes to cleaning/disinfecting large and fast volumes of moving air within heating, ventilation, and air conditioning (HVAC) systems or even inside individual rooms. This does not necessarily imply the technologies do not work as advertised. However, in the absence of an established body of peer-reviewed evidence showing proven efficacy and safety under as-used conditions, the technologies are still considered by many to be “emerging.”

As with all emerging technologies, consumers are encouraged to exercise caution and to do their homework. Registration alone, with national or local authorities, does not always imply product efficacy or safety. Consumers should research the technology, attempting to match any specific claims against the intended use of the product. Consumers should request testing data that quantitatively demonstrates a clear protective benefit and occupant safety under conditions consistent with the intended use. When considering air cleaning technologies that potentially or intentionally expose building occupants, the safety data should be applicable to all occupants, including those with health conditions that could be aggravated by the air treatment. In transient spaces, where average exposures to the public may be temporary, it is important to also consider occupational exposures for workers that must spend prolonged periods in the space.

Preferably, the documented performance data under as-used conditions should be available from multiple sources, some of which should be independent, third-party sources. Unsubstantiated claims of performance or limited case studies with only one device in one room and no reference controls should be questioned. At a minimum, when considering the acquisition and use of products with technology that may generate ozone, verify that the equipment meets UL 867 standard certification (Standard for Electrostatic Air Cleaners) for production of acceptable levels of ozone, or preferably UL 2998 standard certification (Environmental Claim Validation Procedure (ECVP) for Zero Ozone Emissions from Air Cleaners) which is intended to validate that no ozone is produced.

Source: FAQ on “new air disinfection devices” at [Ventilation in Buildings | CDC](#)



¹ See <https://www.motherjones.com/politics/2021/05/air-purifier-covid-asthma-unproven-science-coronavirus-ionization/>

² See https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-filtration_disinfection-c19-guidance.pdf

Photocatalytic Oxidation (PCO) and Gaseous Hydrogen Peroxide



- Consists of a pure or doped metal oxide semiconductor material
 - Most Common Photocatalyst is TiO₂ (titanium dioxide)
- Activated by a UV light source
 - UV-A (400-315nm)
 - UV-C (280-200nm)
 - UV-V (under 200nm) **Ozone can be formed at UV-V wavelengths**
- Light mediated, redox reaction of gases and biological particles absorbed on the surface
- Some units claim disinfection from gaseous hydrogen peroxide
- Possible by-products formed by incomplete oxidation, including from gaseous contaminants

Photocatalytic Oxidation (PCO)



- Some air cleaners using PCO remove harmful contaminants to levels below limits for reducing health risks set by recognized cognizant authorities.
- Some are ineffective in reducing concentrations significantly; manufacturer data should be considered carefully.

For more information, see the [ASHRAE Position Document on Filtration and Air Cleaning](#).

Bipolar Ionization/Corona Discharge/Needlepoint Ionization and Other Ion or Reactive Oxygen Air Cleaners



- Air cleaners using reactive ions and/or reactive oxygen species (ROS) have become prevalent during the COVID-19 pandemic. New devices that are not mentioned elsewhere in this guidance likely fall into this category.
- High voltage electrodes create reactive ions in air that react with airborne contaminants, including viruses. The design of the systems can be modified to create mixtures of reactive oxygen species (ROS), ozone, hydroxyl radicals and superoxide anions.
- Systems are reported to range from ineffective to very effective in reducing airborne particles and acute health symptoms.
- Convincing scientifically-rigorous, peer-reviewed studies do not currently exist on these emerging technologies; manufacturer data should be carefully considered.
- Systems may emit ozone, some at high levels. Manufacturers are likely to have ozone generation test data.

For more information, see the [ASHRAE Position Document on Filtration and Air Cleaning](#) and [CDC Response to ASHRAE ETF on Bipolar Ionization](#).



In the ASHRAE Task Force's Core Recommendations is the cautionary advice:
Only use air cleaners for which evidence of effectiveness and safety is clear.