

In presence of fragrant cleaning products, air purifiers that emit ozone can dirty the air

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Sergey Nizkorodov, assistant professor of chemistry at the University of California, Irvine, found that some air purifiers and cleaning products, when used at the same time, can actually make indoor air dirtier. Credit: UCI

Indoor air purifiers that produce even small quantities of ozone may actually make the air dirtier when used at the same time as household cleaning products, scientists at UC Irvine have discovered.

Ozone emitted by purifiers reacts in the air with unsaturated volatile organic compounds such as limonene – a chemical added to cleaning supplies that gives them a lemon fragrance – to create additional microscopic particles, scientists found. Certain ionic purifiers emit ozone as a byproduct of ionization used for charging airborne particles and electrostatically attracting them to metal electrodes. Ozonolysis

purifiers emit ozone at higher levels on purpose with the ostensible goal of oxidizing volatile organic compounds in the air.

This research appeared online this morning in *Environmental Science and Technology*.

"The public needs to be aware that every air purification approach has its limitation, and ionization air purifiers are no exception," said Sergey Nizkorodov, assistant professor of chemistry at UCI and co-author of the study. "These air purifiers can not only elevate the level of ozone, a formidable air pollutant in itself, but also increase the amount of harmful particulate matter in indoor air."

High levels of airborne particles can aggravate asthma and cardiovascular problems, and have been linked to higher death and lung cancer rates. Excess ozone can damage the lungs, causing chest pain, coughing, shortness of breath and throat irritation.

Nizkorodov and students Ahmad Alshawa and Ashley Russell conducted their experiment in a sparsely furnished office with a floor area of about 11 square meters. They placed an ozone-emitting air purifier in the middle of the room along with a large fan to better mix the air. At timed intervals, limonene vapor was injected in the room. Samples of the air were taken about one meter from the purifier and analyzed for ozone and particulate matter levels.

The researchers tested two types of air purifiers – a commercial ionic purifier that emits about 2 milligrams of ozone per hour, and an ozonolysis purifier that emits approximately 100 milligrams of ozone per hour.

Continuous operation of the ionic purifier without limonene resulted in a slight reduction in the average particle concentration, while operation of

the ozonolysis purifier resulted in no detectable effect on the particle level. When limonene was added to the room, the particle concentration shot up in both cases, on some occasions up to 100 times the original level. Adding limonene to the room when a purifier was not operating produced little change in the overall particle level.

The scientists also developed a mathematical model that precisely matched their experimental observations. This model can be used to predict whether a given air purifier will make the air dirtier in a given indoor environment.

Scientific data on indoor air purifiers will be important as officials begin the process of regulating air purifiers that emit ozone. In September 2006, California Gov. Arnold Schwarzenegger signed into law Assembly Bill 2276, requiring the California Air Resources Board to develop regulations that will set emission standards and procedures for certifying and labeling the devices.

"State regulators should set a strict limit on the amount of ozone produced by air purifiers to protect the public from exposure to unhealthy ozone and particulate matter levels," Nizkorodov said.

Source: University of California - Irvine

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