THE 2B BUZZ

Spring 2025 Newsletter

2B Tech Spotlight

Ice Cream You Scream We All Scream for the AQSync Solar Trailer!

It was Science-Plus-Ice Cream in the parking lot at the 2025 Air & Waste Management Association's meeting in Denver this spring!

2B Technologies served up the combo in showcasing the AQSync Solar Trailer, and it was a hit! Attendees gladly took us up on the offer to enjoy a treat from the Sweet Cow truck while getting a chance to see the AQSync Solar Trailer up close and personal.

Several members of our staff were on hand to demonstrate how the AQSync Solar Trailer makes it possible to deploy FEM-quality air monitoring at different locations quickly, for example in studying air pollution source/receptor relationships, or responding to wildfire events or other emergencies. This "air monitoring station on wheels" has capabilities for measuring ozone, nitrogen oxides, particulate matter, CO, CO_2, total VOCs, and methane. It's truly your one-stop-shop for AQ measurements.

Let us dish up a demonstration for you of our versatile AQSync and AQSync Solar Trailer!

AQSync Air Monitoring Station

AQSync Solar Trailer

Case Study: 2B's Model 106-M Ozone Monitor

Do Colorful Nanoplastics Fade in the Atmosphere?

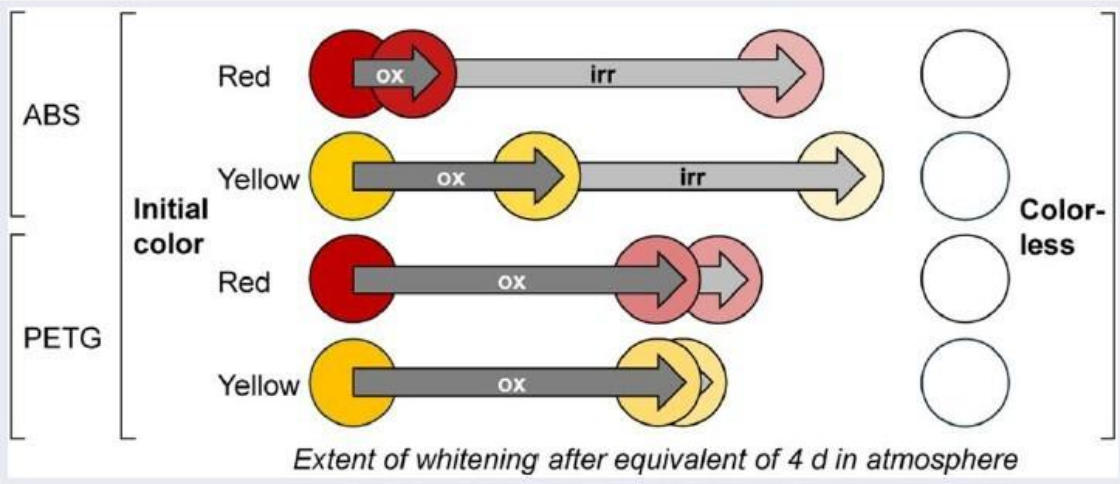
Climate Impacts Could Flip as Nanoplastics Are Whitened by Sun, Ozone

A newcomer has recently been detected in the atmosphere: tiny "nanoplastic" particles. Like any airborne small particle, they can remain in the atmosphere for a week or more, where they have the potential to have direct effects on climate by absorbing or reflecting light, or indirect effects through changes in cloud formation or cloud properties.

Consumer plastics come in all colors, owing to additives such as dyes, pigments, and other organic or inorganic colorants. After degradation in the environment, plastic particles can be swept aloft by wind or wave breaking in the ocean. Nanoplastics can also be directly emitted by industrial processes.

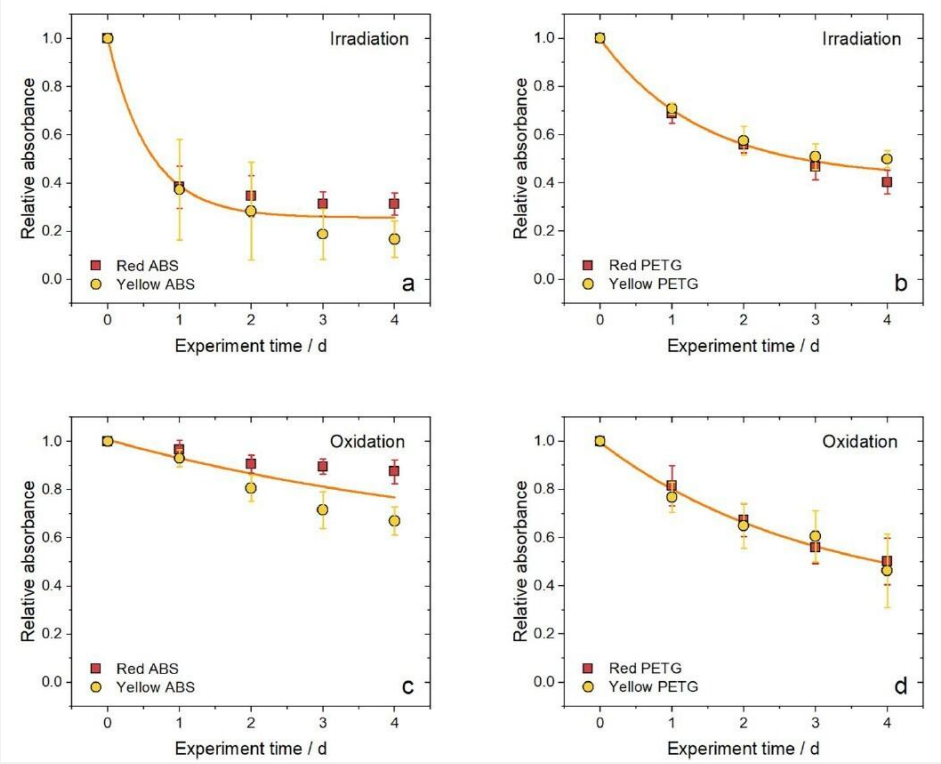
How the nanoplastics hold onto their color during their atmospheric residence time determines whether their direct effect on climate is warming or cooling. While they are "colorful," they are absorbing and therefore "warming." But if their color fades as they are whitened through atmospheric processes, with time they would become more reflective and "cooling."

Researchers at Oklahoma State University set out to do the first experimental study of how the color of the nanoparticles is changed by irradiation and by oxidation. They made nanoplastic particles using the extruder and heated nozzle of a 3D printer, collecting the particles on a filter. The filter samples were then placed in a flow tube apparatus, where they could be exposed to radiation or to ozone. The 2B Tech Model 106-M Ozone Monitor was used to measure the ozone exposure concentration, which was at an atmospherically relevant value of 50 ppb.



Schematic of nanoplastic color transformations under the influence of atmospheric UV radiation or oxidation. ABS (acrylonitrile butadiene styrene) and PETG (polyethylene terephthalate glycol) plastics were used in the study. From Betz et al., Aerosol Science and Technology, 2025.

The nanoparticles lost some but not all of their color, with results dependent on the type of plastic and the type of exposure. Over the 4-day exposure experiments, for the UV-irradiated ABS plastics, most of the fading happened on the first day and fading was smaller for days 2 through 4. Fading was more linear over the whole 4-day period for ABS and PETG plastics exposed to ozone, as well as for the UV-irradiated PETG plastics.



Nanoplastic absorbance changes (460-740 nm) under the influence of UV radiation or oxidation, as measured over four days in the experiment. Figure 5 from Betz et al., Aerosol Science and Technology, 2025.

Overall, the plastic nanoparticles lost about 50% of their light-absorbing capabilities in 4 days of the experiment, with more fading owing to irradiation rather than ozone. Results depended on the type of plastic and the type of colorant in the plastic.

In the real atmosphere, with residence times of one to two weeks, the findings suggest that the combined influences of irradiation and oxidation would lead to more than 50% decreases in absorptivity of nanoplastics, diminishing their warming effect. Particle size also likely makes a difference, with larger sizes such as microplastics having greater color retention. A myriad of plastics and colorants are in use worldwide. All of these factors makes it extremely difficult to incorporate the effects of plastic particulates into climate models.

With plastics seemingly ubiquitous in modern life, clearly more work is needed to understand their atmospheric, climate, and environmental effects, as well as their effects on human health.

Whitening of Nanoplastics through Atmospheric Irradiation and Oxidation, K.L. Betz, S.M. Liyanage, M.R. Miles, J.A. Barton, S.M. Dye, and E.G. Schnitzler, *Aerosol Science and Technology*, DOI: 10.1080/02786826.2025.2478958.

Employee Spotlight: Melody Root
Meet 2B Tech's Office Assistant

If you've called 2B Tech or placed an order with us during the past year, it's a safe bet that you've encountered the friendly voice (or emails) of Melody Root.

Since February of 2024, Melody has been setting the gold standard for her position as 2B Tech's Office Assistant. As her skills became apparent, her responsibilities quickly grew. Besides answering phone inquiries and greeting visitors, she now keeps the company running smoothly by purchasing everything we need, from parts used in building our instruments to office supplies, and more. Plus, she helps keep track of our inventory of over 1000 parts so we don't run out of something right when we're building the instrument you ordered! Melody handles all the invoicing for our customers, too.

It's a very detail-oriented job and Melody excels at keeping it all straight. And she accomplishes it with an upbeat attitude, we might add!

Melody came to 2B Tech after working in the restaurant business as a cook, and in a retail setting (a horse tack and supply store)--where she had a "do everything and anything needed" type of job that prepared her really well for her expanding roles here at 2B Tech.

That job also hinted at the personal passion Melody has for horses, something she's loved since she was a little girl. She would draw horses constantly, especially her favorite black-and-white paint horses. Little did she know, but those drawings would come to life for her later! Just last July, she realized her dream of horse ownership and is now the proud owner of Delta, a 20-year-old horse that (you guessed it) looks just like the ones she drew as a kid. She enjoys trail riding and western riding in general. She and Delta may try competing in some events as they keep learning together.

Which, considering Melody's talents for taking on new tasks, will lead them both to many fun adventures!

Atmosphere News

The Wintertime Ozone Pollution Phenomenon

Oil and Gas Development Activities Create a New "Season" for Air Pollution

Conventionally thought of as a summer phenomenon, ozone pollution has increasingly popped up during wintertime. Over the last ~15-20 years, research has shown that the occurrences are often linked to oil & gas development activities. A new study by Yang et al. investigates the phenomenon of wintertime ozone surges in China and again establishes this link. Their approach to the problem not only reveals some new insights into how and why this happens, and but also suggests some solutions.

The researchers used measurements and modeling to explain the occurrence of four high-ozone episodes in January 2018 in Lanzhou city, in northwestern China. Even though temperatures were below freezing and solar radiation was weak, the hourly ozone values exceeded 100 ppb and were as high as 121 ppb during the episodes. Lanzhou is located in a basin and is one of the largest areas of petrochemical activity in western China--conditions that together are conducive to pollution formation.

The design of the study emphasized detailed measurements of volatile organic compounds (VOCs), which proved to be a pivotal choice. An online gas chromatograph-mass spectrometer measured 60 VOCs. In addition, 16 oxygenated VOCs (OVOCs) were measured by collection and subsequent analysis using high-performance liquid chromatography. This treasure-trove of VOC information, along with air quality measurements from the nearby national monitoring site and meteorological measurements from an autonomous weather station, provided the inputs for the photochemical box model/master chemical mechanism used to study the chemistry.

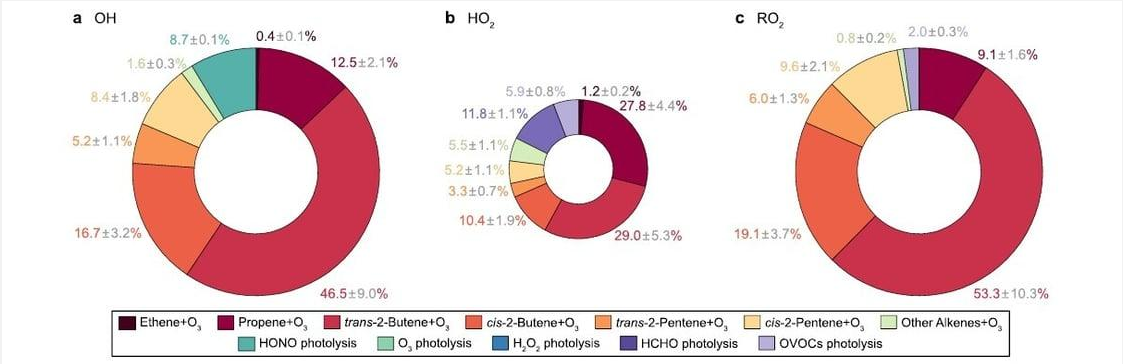


Fig. 3. Daytime (08:00–20:00 LT) average contributions of initial sources to OH (**a**), HO_2 (**b**), and RO_2 (**c**) on O_3 episode days (January 1, 13, 16, and 20, 2018). The size of the ring areas reflects the production rates of OH, HO_2, and RO_2. The contributions of O_3 photolysis and H_2O_2 photolysis to OH formation are omitted (< 0.4%).

Figure 3 from Yang et al., showing alkene/ozone reactions and other contributions to the formation of reactive radicals OH, HO_2, and RO_2.

The results showed that alkenes (hydrocarbons with a carbon-carbon double bond) play a large role in the wintertime chemistry that makes ozone pollution. The alkenes react with ozone to produce reactive hydroxyl radicals (OH), which then enter into reaction cycles with the abundant petrochemical VOCs and the nitrogen oxides in the atmosphere to churn out much more ozone than consumed in the initial step. The initial ozone-alkene reactions can proceed under wintertime conditions of low solar and low temperatures. In fact, they can occur in the dark. Yang et al. found that the four least-complicated alkenes accounted for 80% of the ozone production (ethene, propene, *trans/cis* 2-butene, and *trans/cis* 2-pentene).

The research upends the previous understanding that alkene-ozone reactions mainly lead to ozone destruction. And, this finding of alkene-induced winter ozone pollution suggests a solution: Focusing on reducing alkene (and NOx) emissions could be an effective strategy for mitigating the ozone surges in wintertime.

Wintertime Ozone Surges: The Critical Role of Alkene Ozonolysis, J. Yang, Y. Zeren, H. Guo, Y. Wang, X. Lyu, B. Zhou, H. Gao, D. Yao, Z. Wang, S. Zhao, J. Li, and G. Zhang, *Environmental Science and Ecotechnology* (2024) **22**, 100477.

Link to Journal Article

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