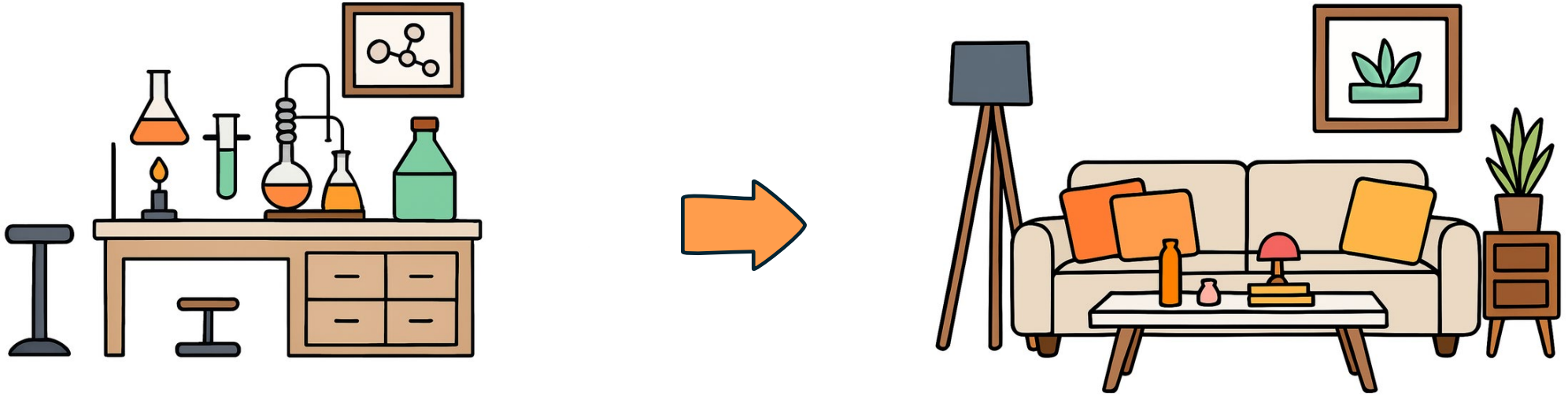
Connections to the real world:
Indoor chemistry research informing public knowledge and interventions



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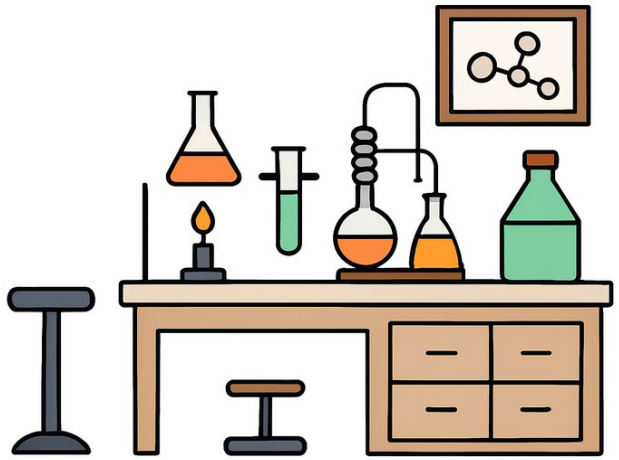
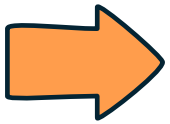
Mechanical Engineering & Environmental Engineering

University of Colorado **Boulder**

NASEM Why Indoor Chemistry Matters Webinar: Past as prologue while looking to the future of indoor chemistry research
December 10, 2025

Examples of indoor chemistry research with direct connections to practice

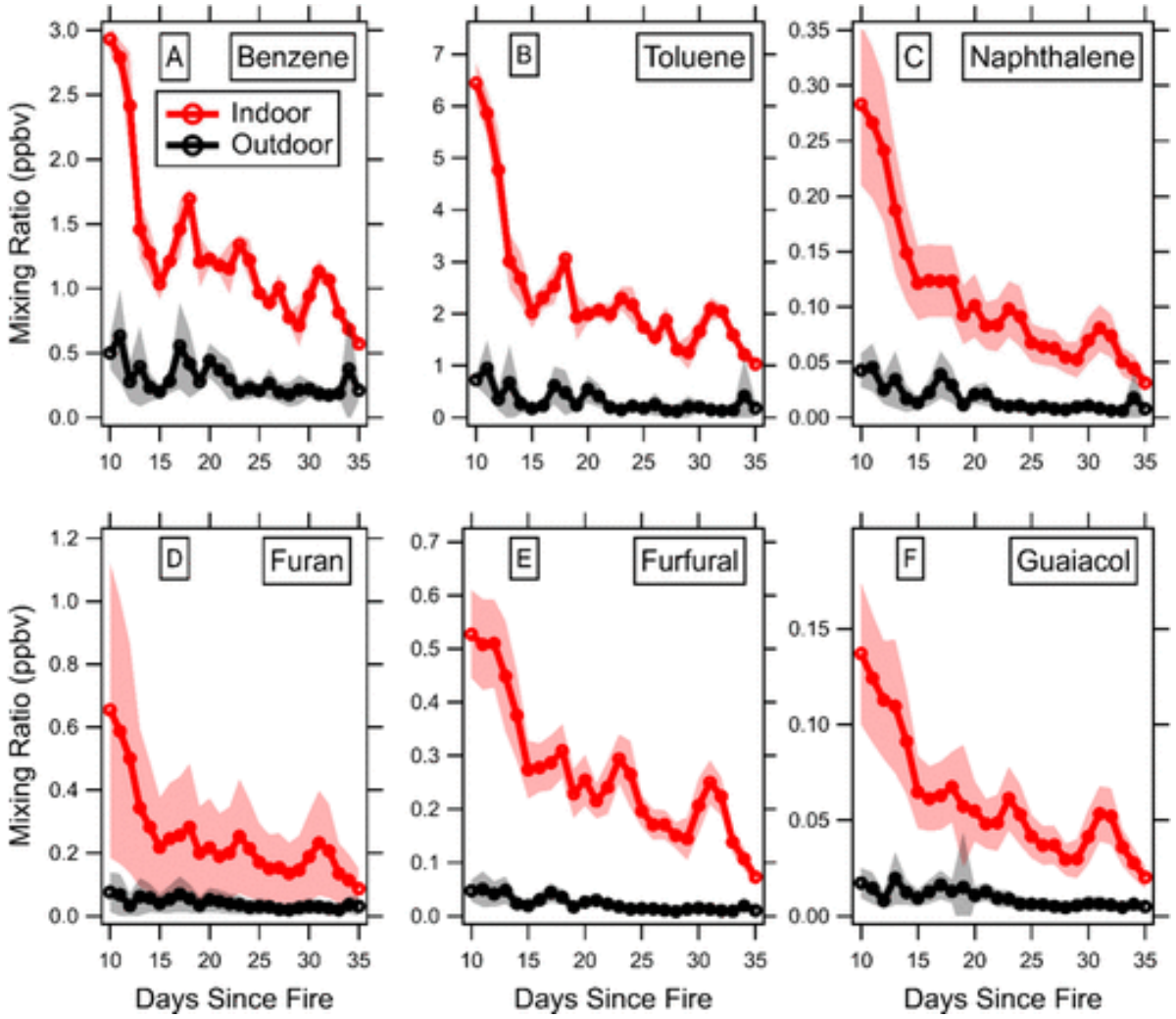




(using wildfires as a case study)

We have learned about the effects of wildfires on indoor environments

Dresser et al. ES&T Air (2024):



Slow decrease in indoor Volatile Organic Compound (VOC) concentrations over the course of weeks after exposure to the smoke plume from the Marshall Fire in Colorado

Connections to the real world: Indoor chemistry research informing public knowledge and interventions.

We have learned about the effects of air cleaning strategies for smoke mitigation (during the fire)

1. Several methods can be effective in removing indoor particulate matter:

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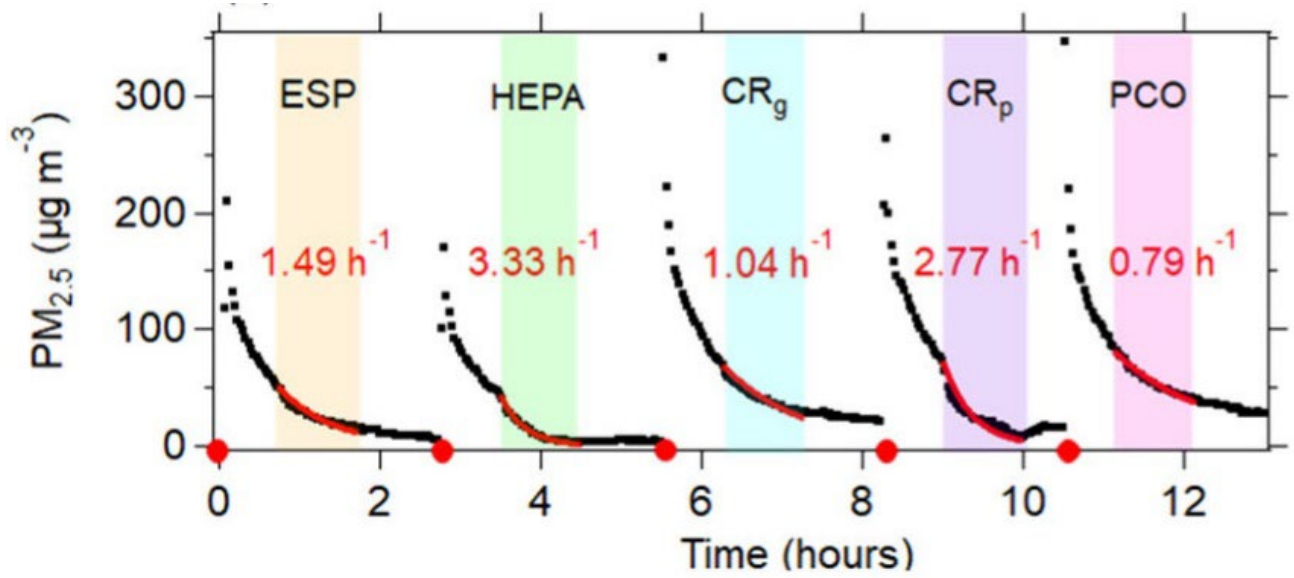

ESP: Electrostatic precipitator
HEPA: High-efficiency particulate air filter
CRg: Corsi-Rosenthal box w/ MERV 8 + activated carbon filters
CRp: Corsi-Rosenthal box w/ MERV 11 filters
PCO: photocatalytic oxidation device

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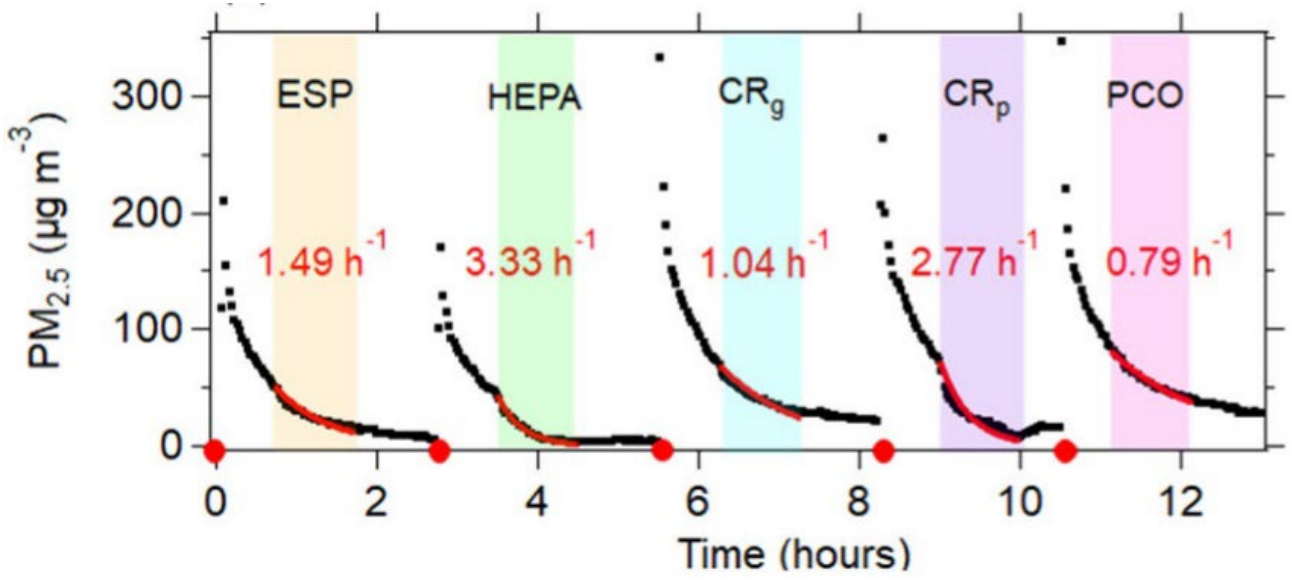

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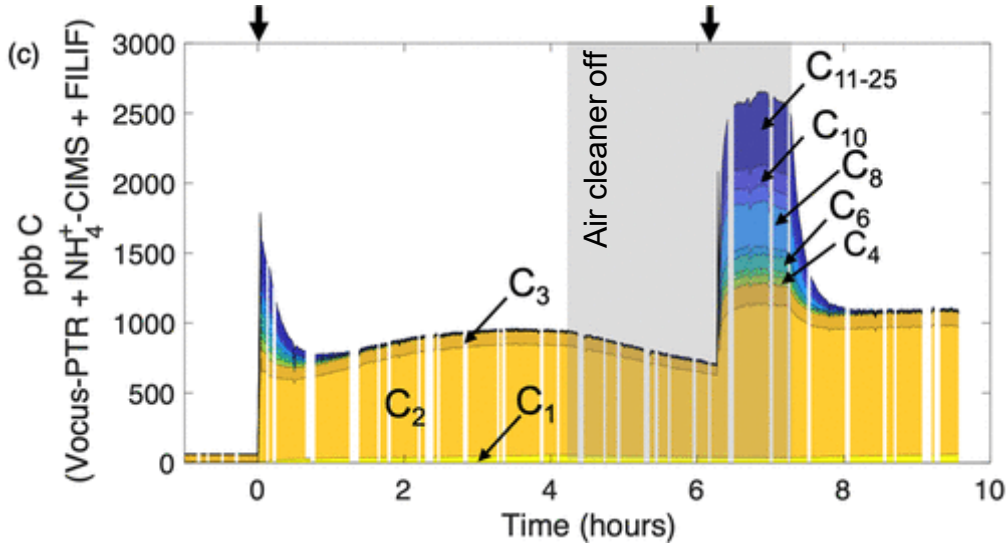
2. Photoelectrochemical oxidation air cleaner consumed larger species (> C_4) and formed C_1 - C_3 oxygenated byproducts:

Ye et al. ES&T Air (2025):



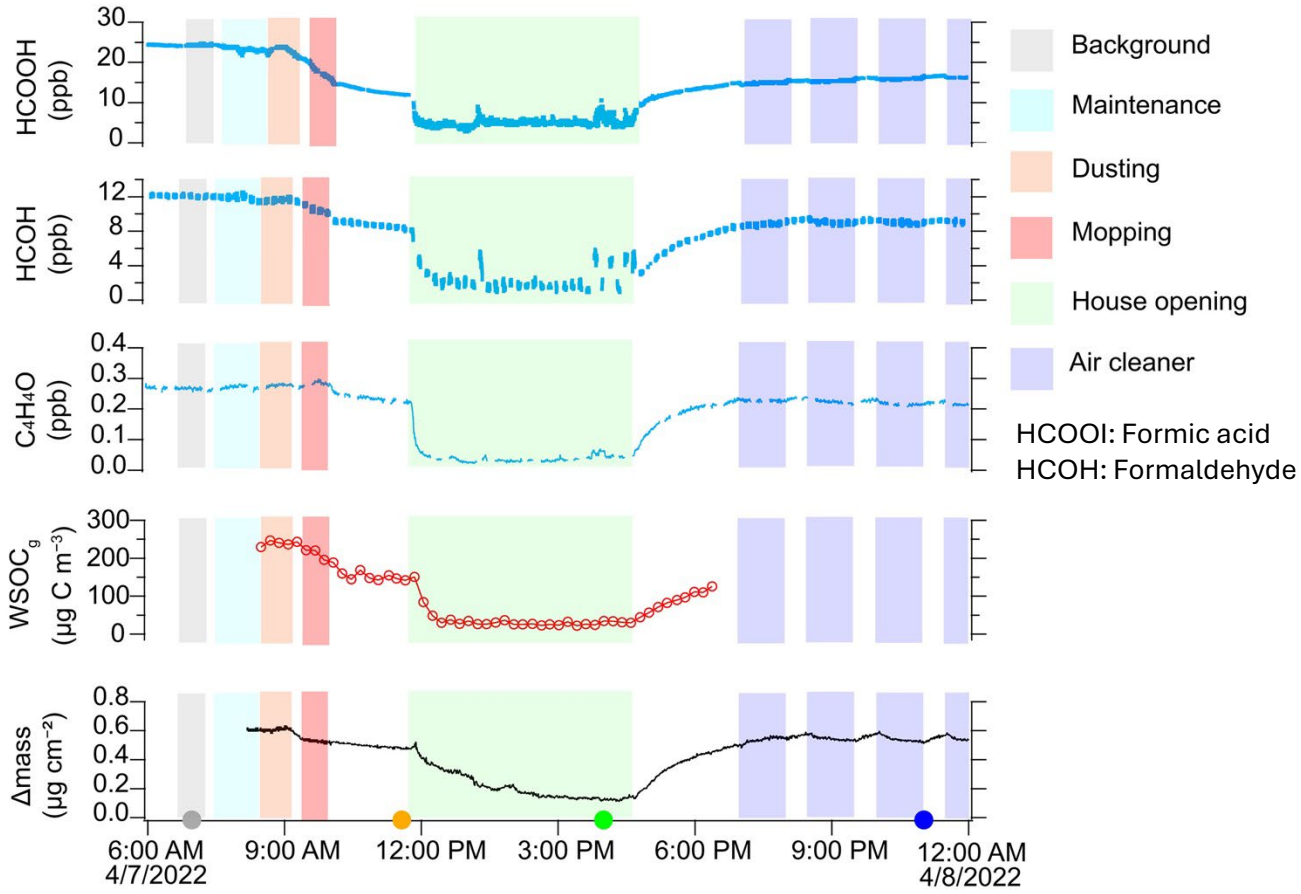
air freshener spray

Connections to the real world: Indoor chemistry research informing public knowledge and interventions.

We have learned about the effects of cleaning strategies for smoke remediation (after the wildfire)

3. Some mitigation efforts are more effective than others in removing VOCs:

Li et al. Sci. Adv. (2023):



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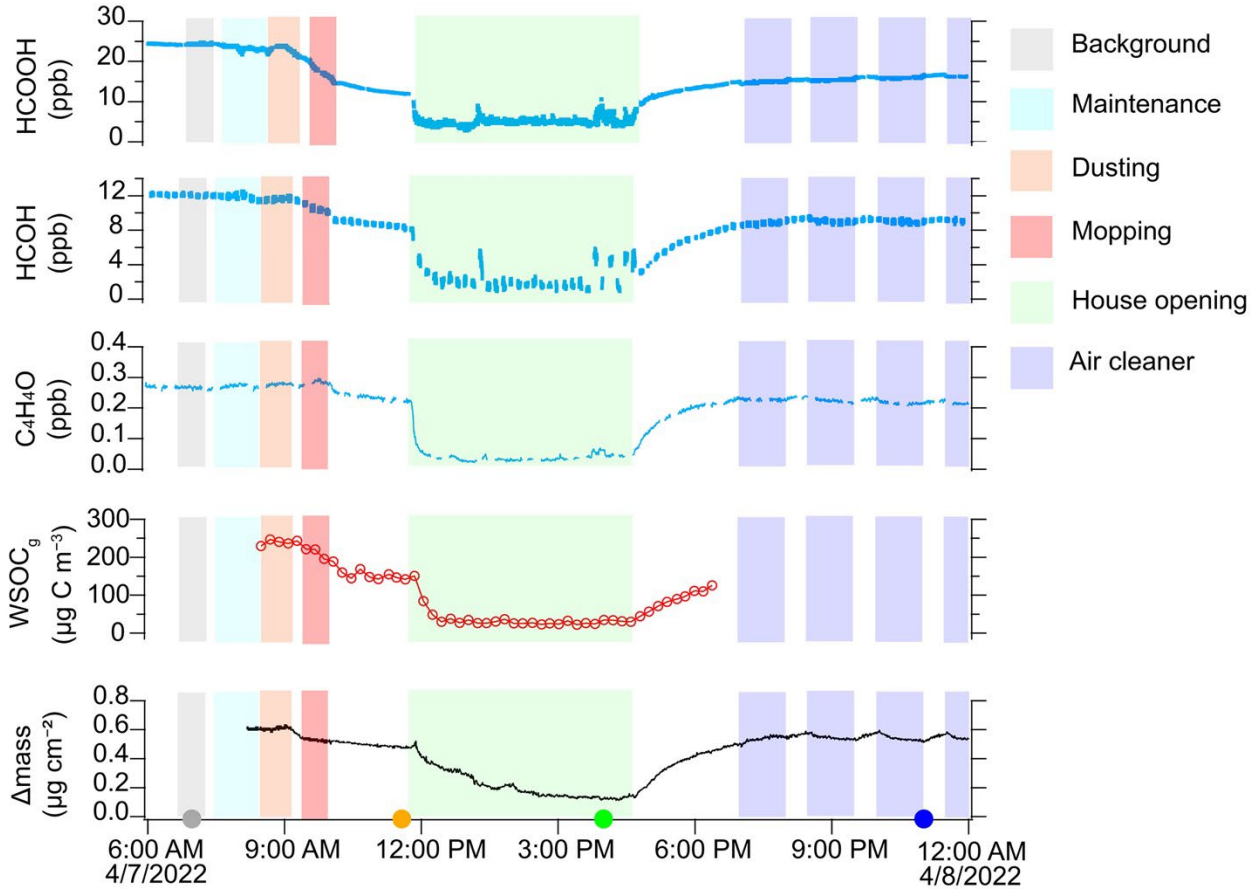
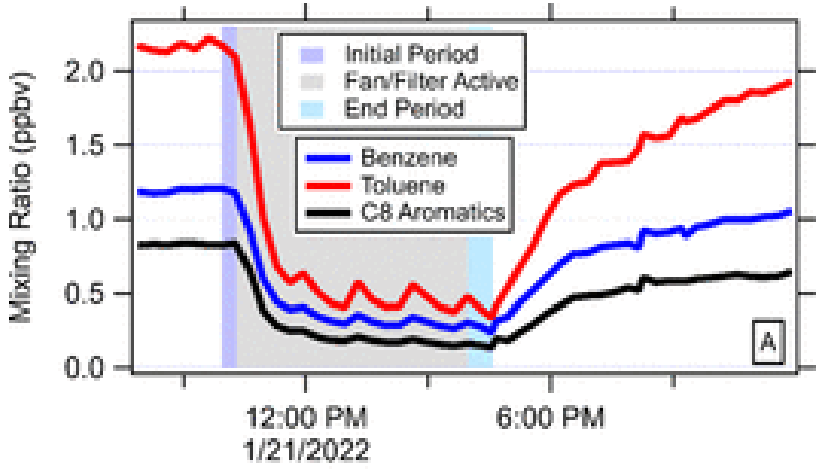


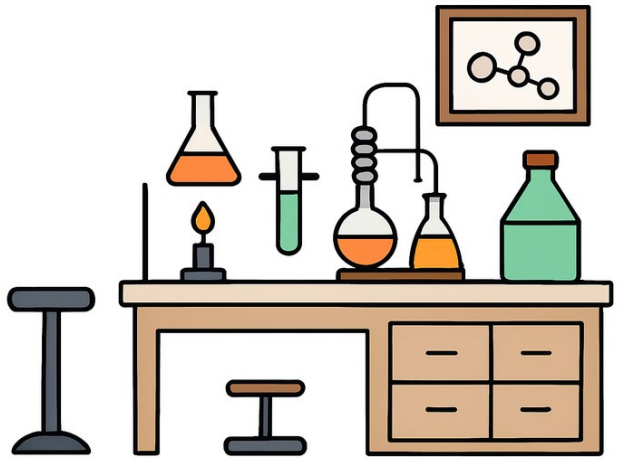
4. Activated carbon filters had a temporary effect in indoor concentrations due to large indoor VOC reservoirs.

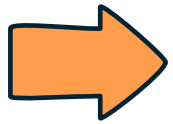
Dresser et al. ES&T Air (2024):



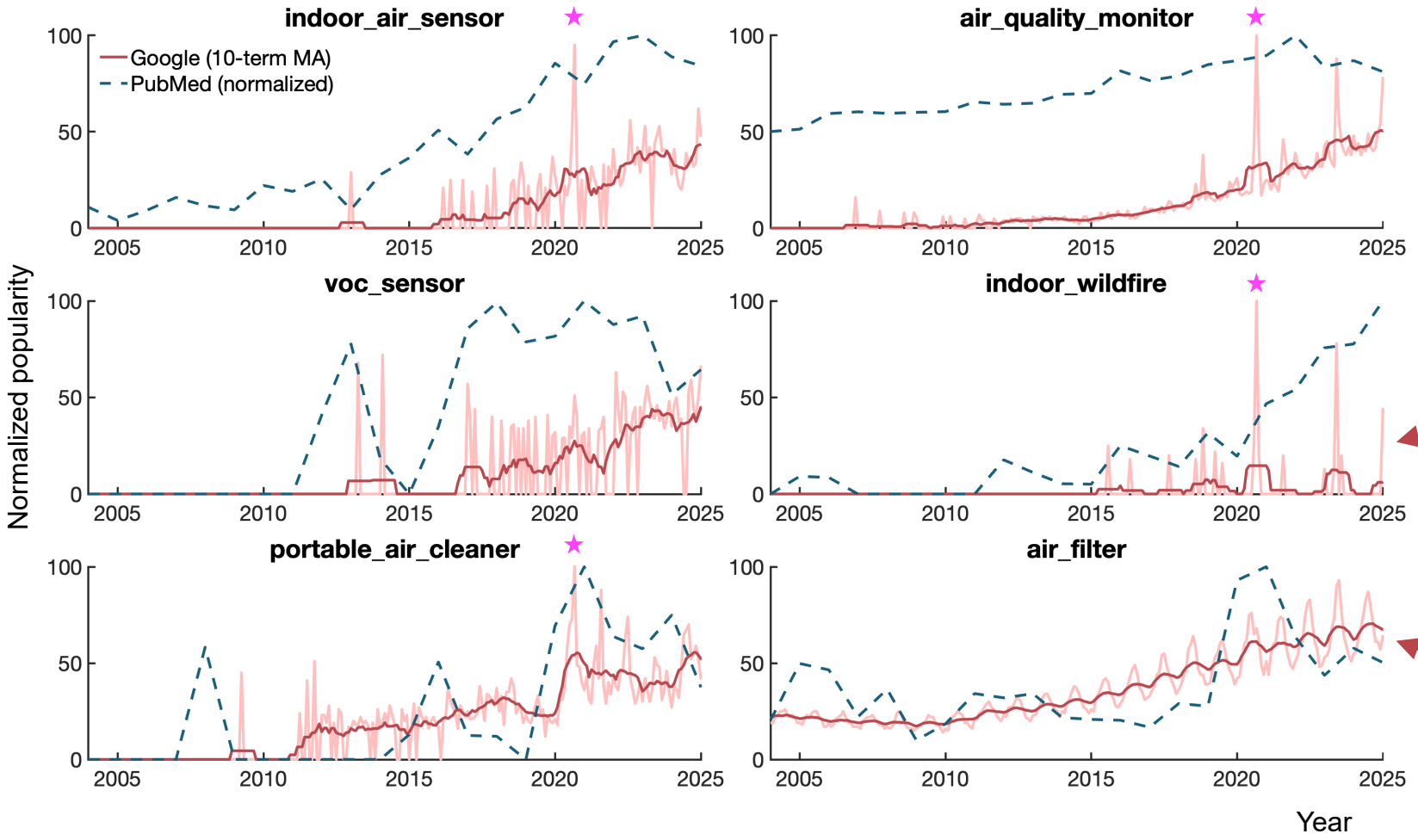
Connections to the real world: Indoor chemistry research informing public knowledge and interventions.

Evidence of science (potentially) reaching the real world





People seem to be more aware of their indoor air



Google search interest trails after PubMed publication trends for the same key terms.

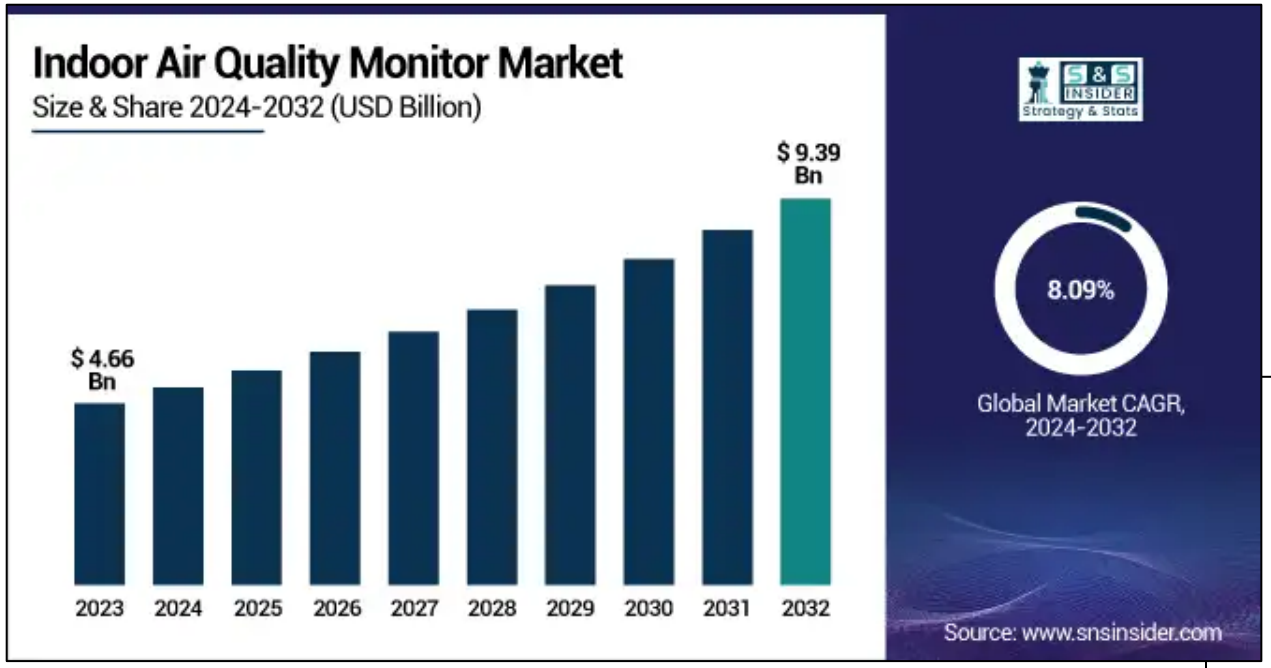
Indoor effects of wildfires are not quite popular yet.

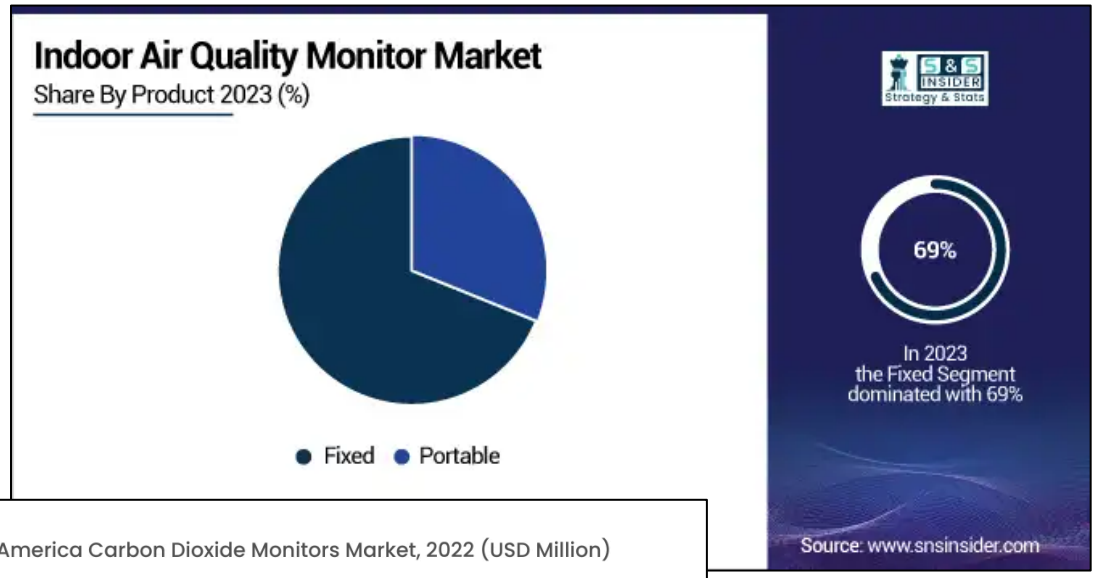
Air filter search surges in summer months.

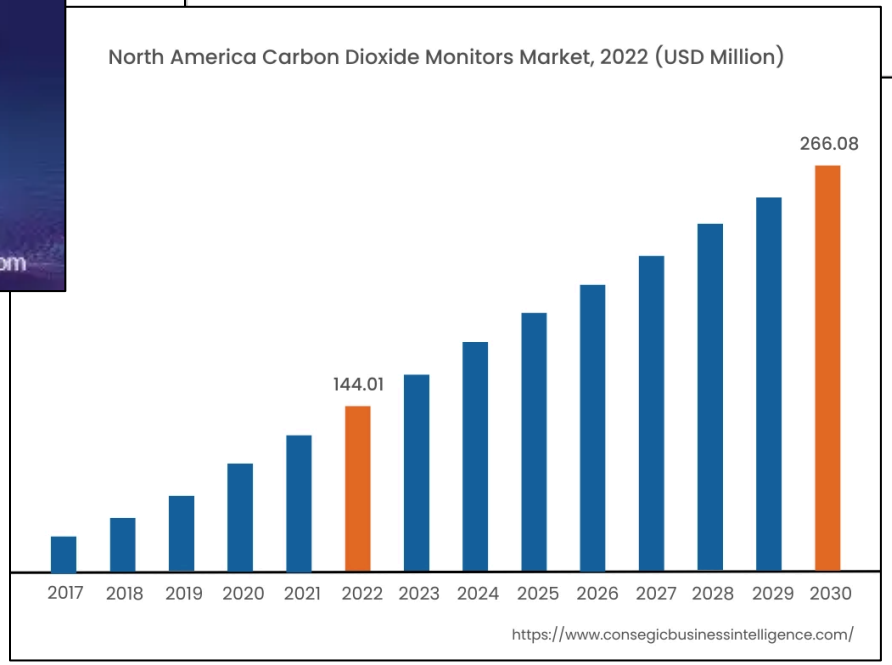
★ September 2020, record-breaking wildfires across the U.S. West

Connections to the real world: Indoor chemistry research informing public knowledge and interventions.

The consumer market is following the public's demand

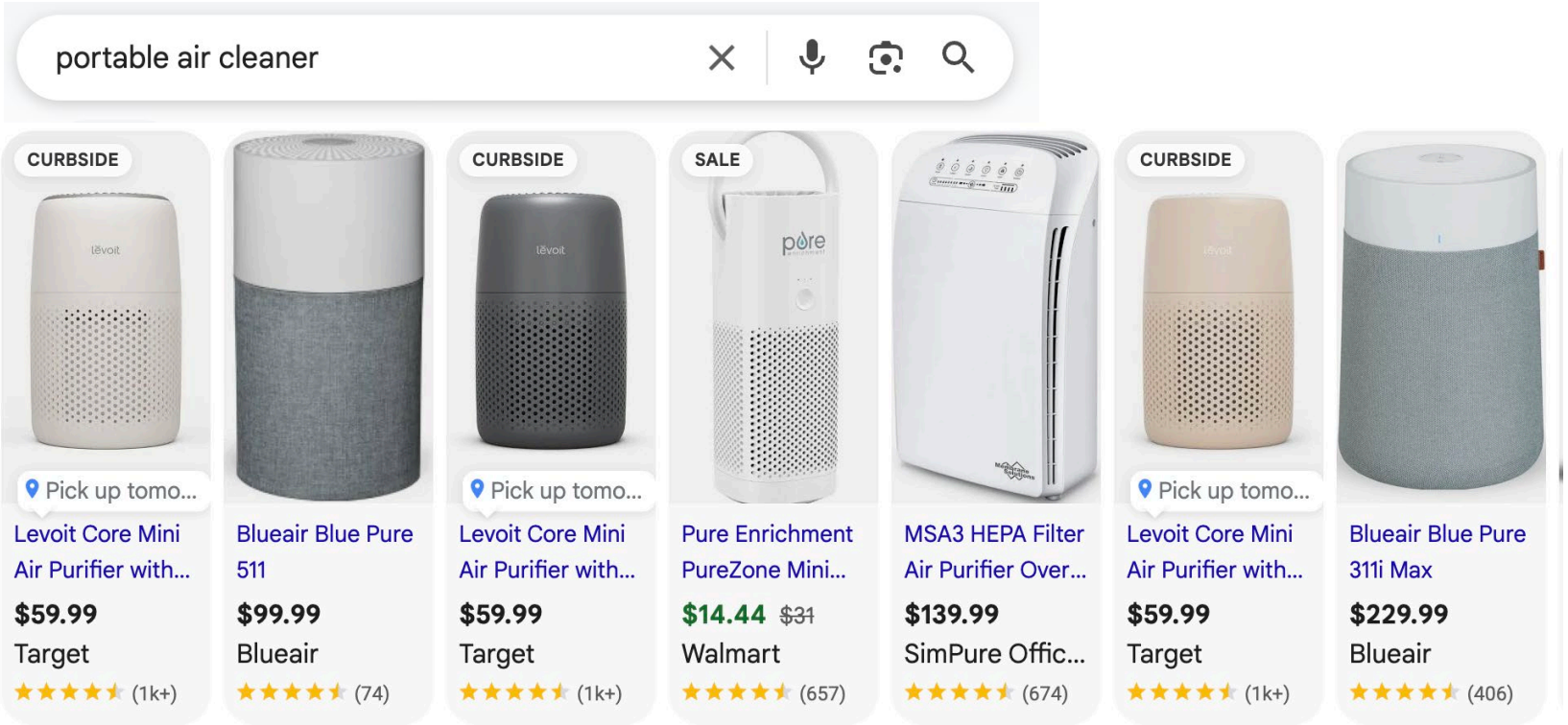


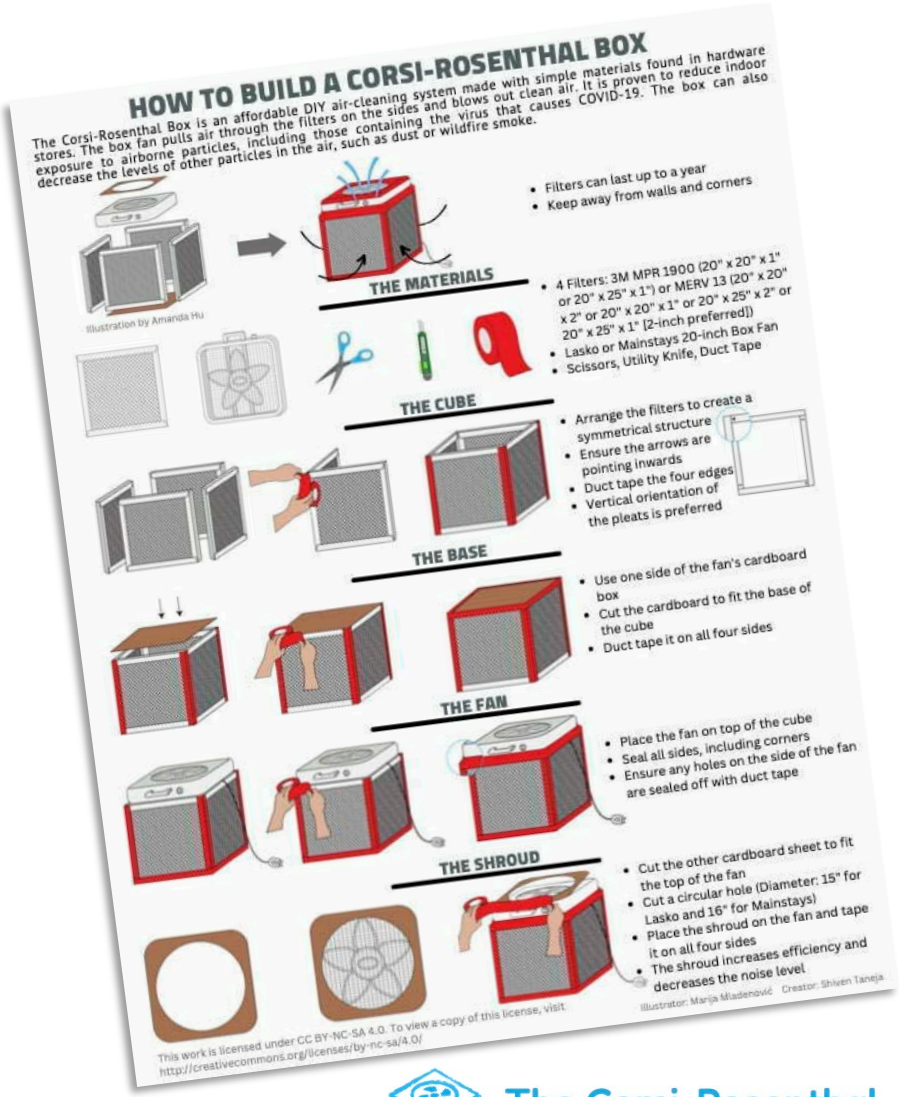




Connections to the real world: Indoor chemistry research informing public knowledge and interventions.

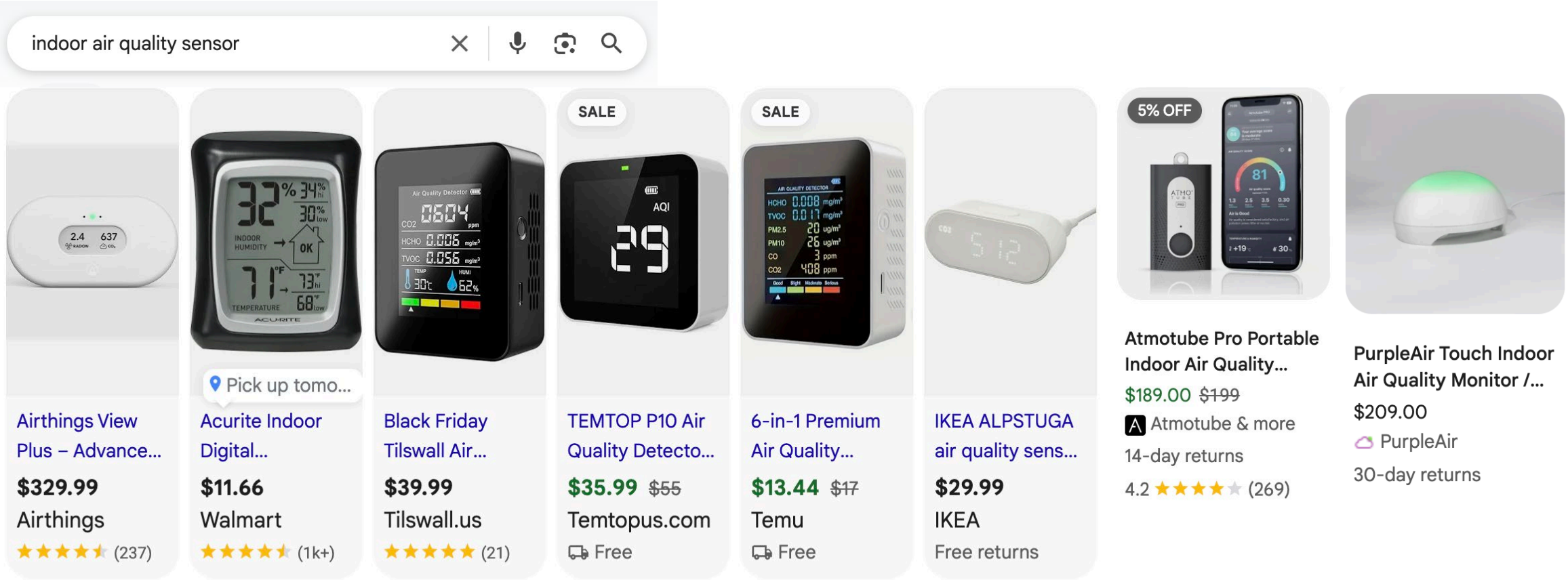
Corsi-Rosenthal boxes and other portable air cleaners are now commonplace





The Corsi-Rosenthal Foundation

Indoor air quality sensor packages are becoming more affordable and popular



Connections to the real world: Indoor chemistry research informing public knowledge and interventions.

What we have achieved

- Greater knowledge about indoor air
- Easier and more affordable monitoring and treatment (to some extent)

What is next

- Better monitoring: Miniaturization of instrumentation enable better spatial and time resolution for field work and consumer use.
- Better treatment: Understanding products of germicidal UV radiation and oxidation-based air cleaners – balancing potential health effects while cleaning & reducing disease spread.
- Better mitigation: Effects of surface cleaning/fouling on indoor air chemistry and quality.
- Better ventilation: Importance and tradeoffs of indoor ventilation.
- Better understanding of health effects of trace gases: CO_2, CO, VOCs, etc. Can we finally, truly understand sick building syndrome?