MADISON IAQ

Market Opportunity: Gas Phase Odor and Pollution Management

Executive Summary

Indoor air gas phase odors and pollutants can be captured through adsorption/chemisorption, converted into a nonpolluting gas through oxidation, or exhausted outside by ventilation/dilution. All three strategies have their place in IAQ. Purafil is a market leader in the adsorption/chemisorption segment of the market.

Explanation of the Science

Physical Adsorption – Adsorption occurs when gases are selectively retained on the surfaces solid. This can be the internal accessible spaces within porous solids, and/or external surfaces such as with interstitial spacing on filters. Common examples of adsorbents include carbon for gaseous organic molecules and silica gel for water vapor. Adsorbents become saturated with the gas phase pollutants and must be replaced. They may alternatively be regenerated usually with heat or low pressure.

Chemisorption – Chemisorption is a type of adsorption interaction, which retains the pollutant gas through a surface-based chemical reaction in the adsorber. In comparison to carbons and other porous materials which only physically retain pollutants, chemisorptive materials permanently trap and chemically change gases through reaction. Potassium permanganate (KMnO4) is an example of a chemical used to create chemisorbents through impregnation of a porous host material. The resulting solid enacts chemisorption on target gases. Chemisorbants may be blended with carbon adsorbents as well to increase the range of gas phase pollutants that the combined mixture can capture. Chemisorbents cannot be regenerated.

Oxidation - Oxidation is one form of chemisorption. It entails the chemical change of a pollutant by electron transfer. Conversion of gas phase odors and pollutants through oxidation, are typically driven by permanganates, ozone, peroxides, gaseous chlorine dioxide, hydroxyls, or superoxides. The oxidation process breaks down organic molecules over a series of reactions to its constituent parts of H2O and

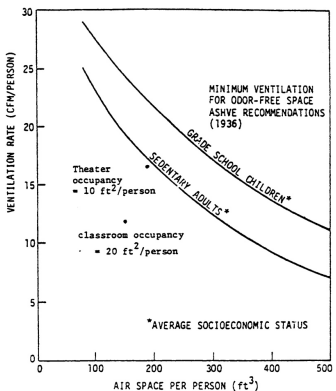
CO2. Incomplete oxidation reactions, such as those possible in inefficiently-size UV/PCO filters, can create hazardous intermediate molecules (like formaldehyde, which is carcinogenic).

Thermal Oxidation - Thermal oxidizers are typically used to destroy hazardous air pollutants (HAPs) and volatile organic compounds (VOCs) from industrial air streams . The pollutants are hydrocarbon based and when destroyed at temperature up to 1200°F via thermal combustion they are chemically oxidized to form CO2 and H2O. . High temperatures can entail large utility costs in operation.

Exhaust Outside

Ventilation/Dilution - Another gas phase odor and pollution management strategy is ventilation/dilution. Bathroom fans and range hoods remove the source pollutants through exhaust ventilation. Ventilation systems have been reported to require as much as 50% of the total energy consumed in buildings (see Control of Indoor Pollution NIH). The makeup air replacing the exhaust air dilutes the concentration of any gas phase odors or pollutants that remain. Dilution is preferred strategy to maintain acceptable oxygen (O2) levels by diluting carbon dioxide (CO2) (see ASHRAE Ventilation for Acceptable Indoor Air Quality). This is also the recommended approach for materials like radon, that could present problems if collected and concentrated on filters.

The foundation of ventilation standards resulted from experimental work reported by C.P. Yaglou in the 1930s. These studies recognized the importance of controlling indoor air quality, as well as ventilation-air quantity, and reported ventilation rates in cubic feet per minute per person required to provide “odor free” environments as functions of available air space per person. It should be noted that these ventilation rates were based on the assumption that outdoor air (“fresh air”) was odor free. The results from Yaglou’s studies are charted below (see Ventilation Requirements Berkeley Labs).



There are different ventilation codes and standards for the following types of buildings: domiciles, education, laboratory, medical, office, public assembly, rehabilitation, warehouse, and industrial.

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PLEASE CONTACT ONE OF OUR EXPERTS TO HELP YOU IMPROVE YOUR INDOOR AIR HYGIENE

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