



Fluoride residues recovered from stainless steel, glass and ceramic surfaces after exposure to Vikane® gas fumigant

A number of structures, including residences, schools, museums, laboratories, and manufacturing, medical and veterinary facilities, are fumigated with Vikane® gas fumigant (99.8% sulfuryl fluoride, Dow AgroSciences, Indianapolis, IN). Occupants, employees, and managers of these buildings often request documentation that deposition of fluoride on inert surfaces, such as stainless steel, glass and ceramic, does not occur during fumigation with sulfuryl fluoride. The chemical properties of sulfuryl fluoride do not result in fluoride deposition on these surfaces during fumigation. Research described below was conducted by in an independent laboratory. This research verifies there is no detectable increase in fluoride residues on steel, glass, and ceramic surfaces following fumigation with Vikane.

Methods

Samples of stainless steel, glass and ceramic surfaces were fumigated in small fumigation chambers (see photo right) at high temperature (95°F) using a high sulfuryl fluoride dosage (≈ 1500 oz-h/1000 ft³) to create conditions favorable for the deposition of fluoride. Non-fumigated control samples of each surface type were maintained under the same environmental conditions as the fumigated samples. Air samples were taken from each chamber during the fumigation to measure the concentration of sulfuryl using thermal conductivity detection via gas chromatography. Aeration of the chambers was done using forced air at the treatment temperature prior to opening the chambers.

After fumigation, a 3.9 x3.9 inch area of each fumigated and non-fumigated sample was wiped twice using two separate laboratory wipe papers. Each paper was moistened with an equal amount of de-ionized water prior to wiping. The two wipe papers for each sample surface were combined in one container, which was labeled and sealed for further processing using standard methodology for recovery of fluoride. After processing, the amount of fluoride was determined using a pH/mV/ion meter with a fluoride combination electrode. The validity of the methodology was determined by applying a solution with a known amount of fluoride to each surface type, allowing the surface to dry, then processing using same methodology as the test surfaces. The recovered fluoride confirmed that fluoride could be recovered with a high level of accuracy using the study sampling and processing methods.

Results

No fumigated surface type had significantly more fluoride recovered than its respective non-fumigated surface (ANOVA, $\alpha=0.01$; see graph to right). There were no significant differences in fluoride concentrations by surface type for fumigated ($P=0.457$) and non-fumigated ($P=0.1699$) samples. Fumigated surfaces did not have significantly more fluoride recovered than non-fumigated surfaces (ANOVA, $\alpha=0.01$).

Conclusions

Fluoride residue recovered from glass, stainless steel and ceramic surfaces following fumigation with Vikane is from exposure to naturally occurring fluoride in the environment and not from exposure to Vikane. These results are consistent with the chemical properties of sulfuryl fluoride which is a relatively nonreactive molecule. Similar results are expected for other inert surfaces exposed to sulfuryl fluoride during fumigation.

