

### ABSTRACT

Reduced sulfur compounds are normally found in wood products and are also produced by corrosive imported gypsum wallboard, complicating evaluation of any residual sulfide gases from such wallboard. To evaluate reduced sulfur compounds in wood, samples of plywood, 2 x 4 framing lumber and pressure-treated wood 1 x 2 furring strips were collected from 54 different homes constructed with sulfide-producing wallboard and under repair, from 2 unaffected homes of similar age, and from 5 local building supply sources. Samples were placed in heat-sealed 1L Tedlar bags containing humidified zero air and equilibrated for 24 hours at 34°C. Headspace gas was analyzed for reduced sulfur compounds by gas chromatography/sulfur chemiluminescence detection (GC/SCD) using ASTM Method D-5504. Carbonyl sulfide and carbon disulfide could be detected frequently using this method and hydrogen sulfide and dimethyl sulfide could also be detected from some samples. Significant differences were found between types of wood products, with the highest concentrations found in pressure-treated wood. Concentrations were not elevated in samples from affected homes compared to control samples. Concrete block walls in the homes were also evaluated for residual sulfide gases using chamber placed on exterior walls. Air from these chambers were evaluated using the ASTM D-5504 method. In the 41 homes with chambers, no detects were reported. The results demonstrate a practical method for evaluating wood and concrete from affected homes for residual gases from wallboard and establish baseline levels for sulfide gases from wood products. The results also support a conclusion that wood and concrete block in homes being repaired did not significantly retain sulfide gases from wallboard.

### Introduction

Corrosive Imported wallboard has been determined to produce carbonyl sulfide and carbon disulfide that are corrosive to certain metals inside a home (copper, brass and silver). Removal of wallboard from homes is an effective approach for removing the source of corrosive gases. A concern has been raised that cross-contamination of remaining building materials has occurred and that materials in the home could retain gases substantially after wallboard removal. This investigation set out to determine if any residual gases remained in porous building materials in affected homes.

Samples of various wood products from homes that previously contained corrosive imported wallboard were collected and analyzed using ASTM Method D-5504 for reduced sulfur gases. These samples were compared with control wood samples to determine if a difference existed. For determining if concrete block used in the construction of the home had retained these gases, a chamber-like structure was affixed to walls in the home and air from within the chamber was analyzed after equilibration for the presence of sulfide gases using the ASTM D-5504 method.

### Materials and Methods

In order to determine if any wood materials remaining in affected homes contain residual sulfide gases, samples of 2 x 4 framing lumber, 1 x 2 pressure-treated furring strips and plywood were obtained from 54 homes that previously contained corrosive imported wallboard (approximately 4"-6" pieces). Homes were allowed to ventilate for at least two weeks before sample collection.

For comparison, samples of the same type of wood were collected from 2 homes constructed approximately the same time as the affected homes, along with 25 samples from 5 separate local lumber supply stores. These samples were approximately the same size and were analyzed using the same methodology used for samples from affected homes.

These samples were shipped to Air Toxics, LTD. in Folsom, CA for analysis using gas chromatography/sulfur chemiluminescence detection. Samples were each placed in 1L Tedlar (CEL brand) bags. After insertion, the bag was heat-sealed, evacuated and then filled with 200ml of humidified zero air. The Tedlar bags containing the samples were equilibrated at 34°C for approximately 24 hours. For the analysis, sample vapor was injected into the GC/SCD for analysis using a modified ASTM D-5504 method.

### Materials and Methods (cont).

To determine if concrete block had retained any residual gases, chambers (approx. 45 cm x 45 cm) constructed of a polypropylene material were placed on at least two concrete block walls inside 41 homes that previously contained corrosive imported wallboard. A non-reactive glass spacer was placed inside the chamber to create space for air to accumulate. These chambers were allowed to equilibrate for at least 48 hours before collection of air from inside the chamber. An SKC Personal Sampling Pump (Model 224-PCXR8) with non-reactive teflon tubing was used to collect the sample from within the chamber into a 1 L Tedlar (CEL brand) bag.

Air samples from the wall chambers were shipped to Air Toxics, LTD. in Folsom, CA or Lakeland Laboratories in Lakeland, FL for analysis via ASTM D-5504



Photos of wood samples in evacuated 1L Tedlar bags.

### Carbonyl Sulfide and Carbon Disulfide in Control Samples and Home Samples

#### Detection in Control Samples (n=34)

Sample Type	Carbonyl Sulfide	Carbon Disulfide
Furring Strips	7/9	1/9
Plywood	10/12	4/12
2 x 4 Framing Lumber	5/13	0/13

#### Detection in Home Samples (n=298)

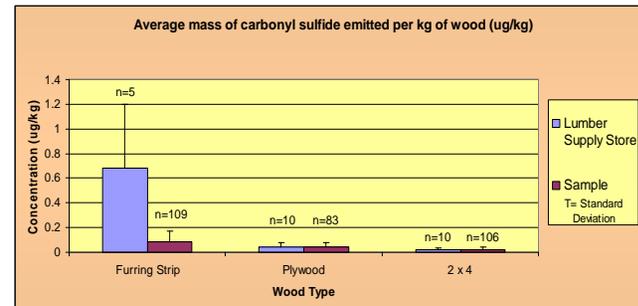
Sample Type	Carbonyl Sulfide	Carbon Disulfide
Furring Strips	83/109	3/109
Plywood	40/83	4/83
2 x 4 Framing Lumber	27/106	6/106

Carbonyl sulfide was frequently detectable in all types of wood products, both in controls and home samples, demonstrating that background, normally occurring levels of this compound must be accounted for in considering the possibility of residual gases in homes with corrosive imported wallboard.

For results reported as non-detects, a value 1/2 of the reporting limit was used (RL/2) for analysis. For lab duplicates reported, the sample and the duplicate were averaged.

Carbon disulfide was infrequently detected, making statistical comparisons uncertain, but the detected results were higher in controls (average= 0.320) and home samples average =0.067).

### Average Mass of Carbonyl Sulfide Emitted per kg of Wood.



•The number of detected results from unaffected homes was too low for use in statistical comparisons. However, average detected levels were similar to results from other groups ( Furring Strip = 0.037; Plywood = .072; and 2 x 4= 0.043).

•Furring strips contain the highest concentrations of carbonyl sulfide from both control samples and homes sampled.

•No statistical difference was found between carbonyl sulfide concentrations in control samples and samples from homes that contained corrosive defective drywall. (p>0.05)

### Cement Block Chamber Results

•No detections for sulfide gases were reported in the more than 80 chambers that were placed on walls in homes that previously contained corrosive imported wallboard

•None of the gases produced by corrosive imported wallboard were being released by the concrete block in homes.

### CONCLUSIONS

•Wood from homes that do not contain corrosive imported wallboard and wood from local building supply stores contain carbonyl sulfide and carbon disulfide.

•Background levels of carbonyl sulfide and carbon disulfide must be taken into account when evaluating materials from a home that previously contained corrosive imported wallboard

•Sampling of wood from 54 homes previously constructed with corrosive imported wallboard does not demonstrate apparently elevated carbonyl sulfide residues reflecting residual gas from the wallboard. Levels are slightly lower than found in new wood products.

•Concrete block used for construction of the home has not retained any residual sulfide gases.