Comparison of Methods Utilized by Commercial Laboratories for Analyses of Bulk Drywall Samples

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Introduction

Detrimental effects to property and health are reportedly associated with the use of certain drywall products within homes throughout Florida and other states. Specific agents causing these effects are suspected but have not yet been conclusively identified. Homeowners, field professionals, and others dealing with these drywall problems often need to know whether certain drywall products are likely affected (corrosive) or not. In response to this demand, various laboratories have developed unique methods for analyzing drywall samples.

Purpose & Objectives

The purpose of this study was to compare the outcomes reported by three (3) independent, commercial laboratories for analyses of drywall samples.

- Determine if laboratories using different methods could correctly identify if drywall samples were from China.
- Determine if conclusions reached by different laboratories and methods agreed.
- Examine the conclusions reached by laboratories regarding the contents, emissions, and/or origins of unmarked drywall samples.

Methods

- Bulk samples of drywall were obtained from various sources, identified as either domestic or imported from China, and if they were from an affected or unaffected home, and submitted blind to each laboratory.
- Samples of drywall were split so that adequate amounts of material were sent to three private laboratories offering analysis services related to drywall. Samples were sent without labels or markings that would indicate manufacturer or origin.
- Laboratory A analyzed samples using Gas Chromatography/Mass Spectrometry (GC/MS) for determining orthorhombic cyclooctasulfur and Gas Chromatography/Sulfur Chemilumimescence Detector (GC/SCD) for hydrogen sulfide emissions.
- Laboratory B analyzed samples using Energy Dispersive Spectroscopy (EDS) for detection of strontium inclusions, X-Ray Fluorescence (XRF) for identification of specific elements and their respective percentages, and GC/MS for assessment of carbon disulfide content.
- Laboratory C analyzed samples using Inductively Coupled Plasma (ICP) to determine strontium content, and also performed headspace analyses by Gas Chromatography/Atomic Emission Detector (GC/AED) to identify and quantify volatile sulfur compounds.

Independent Comparison of Laboratory Conclusions on Origin and Emission of Corrosive Gasses for Eight Drywall Samples

Domestic	Sample ID	Lab A	Lab B	Lab C
Unaffected Home	7	Non-Suspect	Non-Problematic	Non-Problematic
Affected Home (1)	5	-----	Non-Problematic	Non-Problematic
Affected Home (2)	6	Non-Suspect	-----	Non-Problematic
Imported from China				
Unaffected Home (1)	3	Non-Suspect	Non-Problematic	Non-Problematic
Unaffected Home (2)	4	Non-Suspect	Non-Problematic	Non-Problematic
Affected Home	8	Suspect	Problematic	Problematic
Unknown (1)*	1	-----	Problematic	-----
Unknown (2)*	2	-----	Problematic	-----

----- Indicates sample was NOT submitted to this laboratory for analysis.

Sample No. 8-Lab A: determined to be suspect drywall despite orthorhombic cyclooctasulfur content was less than 20mg/kg

Sample Nos. 1, 2 and 8 Lab B: drywall of Chinese origin
Sample No. 3 Lab B: off-gassing was not detected by GC/MS, XRF spectra close to that of unproblematic Chinese drywall

Sample No. 7 Lab B negative for EDS strontium inclusions; low XRF strontium levels; considered domestic synthetic by XRF spectra low XRF strontium levels, considered domestic synthetic by XRF spectra

Sample No. 3 Lab C: ICP strontium > 2000mg/kg; drywall likely of Chinese origin
carbon disulfide level near that of uncontaminated drywall; some carbonyl sulfide detected
Sample No. 4 Lab C: ICP strontium 800-900mg/kg; drywall of Chinese, Beijing, or US origin
carbon disulfide and carbonyl sulfide levels elevated
Sample No. 5 Lab C: ICP strontium 800-900mg/kg; drywall of Chinese, Beijing, or US origin
carbon disulfide and carbonyl sulfide levels elevated
Sample No. 6 Lab C: ICP strontium <400mg/kg; US drywall
carbon disulfide and carbonyl sulfide levels near background
Sample No. 7 Lab C: ICP strontium <400mg/kg; US drywall
carbon disulfide level slightly elevated and carbonyl sulfide level 7X greater as compared to background
Sample No. 8 Lab C: ICP strontium >2000mg/kg; problematic Chinese drywall

*Samples 1 & 2 were obtained from a warehouse of Chinese drywall. Two different manufacturers were indicated on palet labels indicating that China was the country of origin. Sample sizes were too small to allow splitting and submission to other laboratories.

Comparison of Laboratory Approaches

Laboratory A used orthorhombic cyclooctasulfur levels in the gypsum in conjunction with hydrogen sulfide in the headspace as indicators of corrosive gas emissions.

Laboratory B used Strontium levels >0.1% in the gypsum to determine if the sample was from China and required further analysis. They used carbon disulfide emissions to demonstrate emission of corrosive gasses.

Laboratory C used Strontium levels above 2,000 ppm in the gypsum to determine if the sample was from China. Analysis of headspace emissions for carbonyl sulfide and carbon disulfide were used as indicators of corrosive gas emissions.

Limitations

Very small sample size.

Few Laboratories participating.

Limited range of drywall types used to evaluate analytical methods.

No replicates of individual samples submitted for analysis.

Conclusions

The analytical results reported for replicates of same-source samples were consistent among the laboratories. The outcome of this study suggests that although the analytical methods employed by the individual laboratories participating in this study differed, they ultimately yielded the same conclusions regarding origin of sample and emission of corrosive sulfur-containing gasses from drywall samples. Due to the limited scope of this evaluation, further testing is necessary to compare various analytical methods in their ability to distinguish corrosive drywall from non-corrosive drywall.

Participating Laboratories:

Laboratory A: Columbia Analytical, Inc. (Simi Valley, CA)

Laboratory B: Engineering Services Inc. (Fort Myers, FL)

Laboratory C: Unified Engineering, Inc. (Aurora, IL)

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