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## Wallboard Woes

## Odors and corrosion raise concern over drywall imported from China

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**THERE'S SOME** curious chemistry going on within walls of homes across the southeastern U.S. Complaining of foul odors, rampant copper corrosion, and respiratory problems, homeowners are raising a stink about the latest suspicious import from China—drywall.

The troubles, which started with complaints from residents of a few dozen Florida homes that smelled of rotten eggs, have spread to several states and given rise to class-action lawsuits against both homebuilders and wallboard manufacturers. The <u>Consumer Product Safety Commission</u> (CPSC) is currently investigating the problem, as are health departments in several southeastern states. So far, these investigations have traced the problem to drywall that was imported from China starting in 2004. But the chemicals causing the problem and just how they got into the building materials are still something of a mystery.

Drywall—also known as wallboard, plasterboard, and gypsum board—is basically a layer of gypsum-based plaster sandwiched between two sheets of paper. According to the <u>Gypsum Association</u>, the majority of gypsum in domestic drywall comes from mines or quarries, although some is a by-product of flue gas desulfurization in coal- or oil-fueled power plants. Gypsum is chemically composed of calcium sulfate dihydrate, a fairly innocuous material.

To date, air sampling for volatile chemicals taken by several different laboratories from the odorous Chinese drywall has identified the sulfurous gases carbon disulfide, carbonyl sulfide, and hydrogen sulfide. The gaseous emissions appear to worsen as temperature and humidity rise, which could account for why the problem seems to be concentrated in the Southeast.



Chemical analyses of the imported drywall have produced contradictory results. <u>Lennar</u>, one of Florida's largest homebuilders, hired <u>Environ International</u> to test the suspect drywall in homes it built. Thomas D. Gauthier, an analytical chemist with Environ, tells C&EN that tests show the presence of elemental sulfur in the Chinese wallboard but not in wallboard from the U.S. The gypsum in question could have come from a mine that's rich in the element, Gauthier says, noting that he and his colleagues are working to determine mechanisms for the formation of carbonyl sulfide and carbon disulfide from elemental sulfur in a drywall matrix.

Phillip Goad, a toxicologist at the <u>Center for Toxicology & Environmental Health</u>, studied the smelly drywall for Knauf Plasterboard Tianjin (KPT), one manufacturer of the material. Goad says his analysis didn't reveal elemental sulfur in the Chinese product, but rather iron disulfide, or pyrite, which wasn't present in domestic drywall. KPT believes the gypsum it was mining also contained the iron disulfide, Goad tells C&EN, and has stopped using that mine.

Florida's Department of Health's drywall analyses, which were done by Unified Engineering, revealed an entirely different anomaly in the Chinese wallboard. Lori A. Streit, an analytical chemist with Unified, found strontium sulfide in the odorous wallboard.

"The presence of strontium sulfide in gypsum wastes is highly unusual," says Bernd G. Lottermoser, author of the book "Mine Wastes: Characterization, Treatment & Environmental Impacts" and a professor of geochemistry at Australia's James Cook University. "If it is really present, it would likely be a reaction product generated during manufacturing of the plasterboard."

Andrea Burdack-Freitag and coworkers at Germany's <u>Fraunhofer Institute for Building Physics</u> recently published an independent analysis of odorous sulfur compounds from rejected Chinese gypsum board and some foul-smelling stone taken from a Chinese gypsum mine (*Clean*, DOI: 10.1002/clen.200800224). Burdack-Freitag identified 35 sulfur-containing odorants, 27 of which have never been reported as odor-active compounds from building materials. The team concluded that some of these smelly compounds likely originated in the mined gypsum, whereas others were a result of the manufacturing process.

Air sampling from homes built with Chinese wallboard has only identified sulfurous gases in small amounts, but Streit notes that because these gases can be short-lived, it's very difficult to quantitatively measure them. The bad smells indicate their presence, but the human nose is capable of detecting very small amounts of stinky chemicals, she says.

WHAT'S MORE worrisome has been the corrosion of copper pipes, wiring, and air conditioner coils. These copper surfaces turn black and powdery in homes with the suspect drywall. This type of corrosion is indicative of reaction with hydrogen sulfide, several chemists tell C&EN. The



View Enlarged Image Dark Mark Black corrosion forms on a copper air conditioner coil in a house in Florida built with Chinese drywall that emits sulfurous gases. hydrogen sulfide may originate with sulfur or metal sulfide particles in the drywall or could come from hydrolysis of carbonyl sulfide gas emitted by the drywall.

No tests taken as of press time have suggested the levels of sulfur gases in the affected homes are high enough to be dangerous, but many homeowners have reported nosebleeds, sinus problems, and respiratory infections. CPSC spokesman Scott Wolfson says the agency, in cooperation with the Environmental Protection Agency and the Centers for Disease Control & Prevention, is investigating both the health effects of exposure to these gases and the electrical safety issues that have arisen from the corroded copper wiring. Wolfson would not speculate as to how long these investigations will take.

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