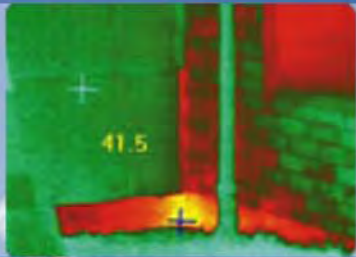


Searching for the Cause of Chinese Drywall Off Gassing

New Directions in
Sustainable Building Construction
for Architects & Builders



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We are investigating the cause of the sulfur gas release from problem Chinese drywall.

Our hypothesis is that the cause of the off-gassing is the impurity marcasite. Marcasite is identical in composition to pyrite but has a different crystalline structure. It is highly reactive compared to pyrite. We believe marcasite could be the catalyst for chemical reactions with the known organic contaminants in problem drywall that lead to the sulfur gas release. It may be that bacteria in the drywall are a catalyst for gas release, but our hypothesis is that the major release of sulfur gases is from a chemical and not a biological reaction.

To facilitate analysis, we are concentrating the drywall impurities by spinning crushed drywall samples in a centrifuge. Materials of different densities form bands inside the test tubes.

The heavier metal-containing materials, including any iron-containing marcasite, we hypothesize would settle in the bottom bands. At the top would be the lighter relatively pure gypsum.

In the next few weeks, we plan to analyze the concentrated materials in the lower bands under XRD, and SEM/EDS on samples with FeS₂. (Pyrite is cubic while marcasite is orthorhombic.) We expect to find significant concentrations of marcasite ... only in problem (corrosive) drywall.

What we have at this stage of this investigation is informative and interesting to those concerned about problematic Chinese drywall.

On pages 3-5 we see pictures of test tubes containing 6 different types of ground up drywall. The pictures were taken after immersing the samples in a dense liquid and then spinning in a centrifuge. This procedure results in the separation of materials based on density.

This procedure produces a visual fingerprint that can be used to identify the different types of drywall. Clearly, all of these fingerprints are different. Knauf Tianjin is not the same as Knauf Natural, National Synthetic, or BNBM. Clearly there are two forms of BNBM one more pure than the other but neither looking like Knauf Tianjin.

From the sound of this ... seems like Marcasite could be "our guy".

From Wikipedia:

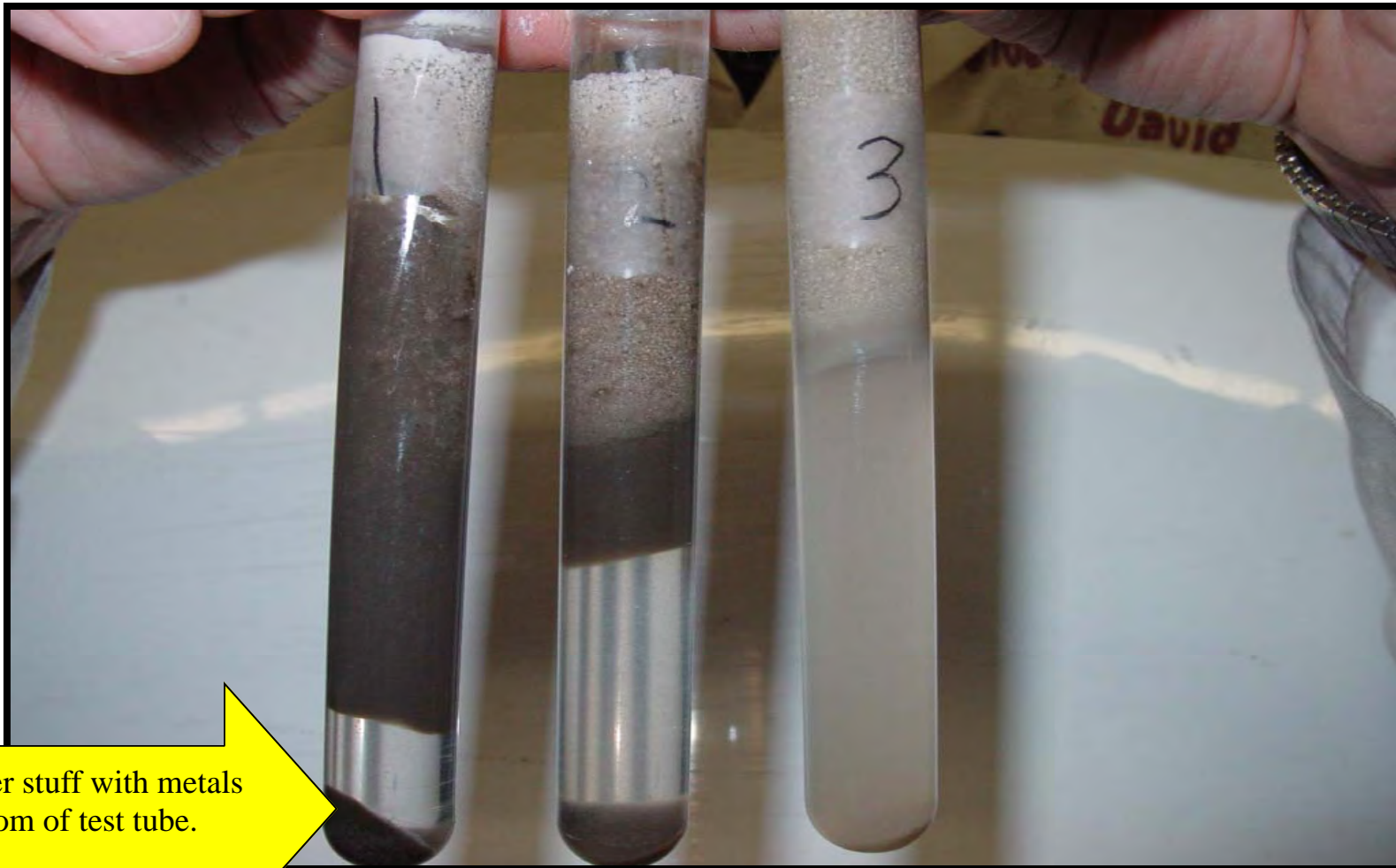
The mineral **marcasite**, sometimes called **white iron pyrite**, is iron sulfide (FeS_2). Marcasite is often mistakenly confused with pyrite, but marcasite is lighter and more brittle. Specimens of marcasite often crumble and break up due to the unstable crystal structure, and it is this crystal structure that is the main difference between marcasite and pyrite.

As a secondary mineral it forms by chemical alteration of a primary mineral such as pyrrhotite or chalcopyrite.

Marcasite may go through a condition known as "pyrite decay", in which a specimen slowly disintegrates into a white powder.

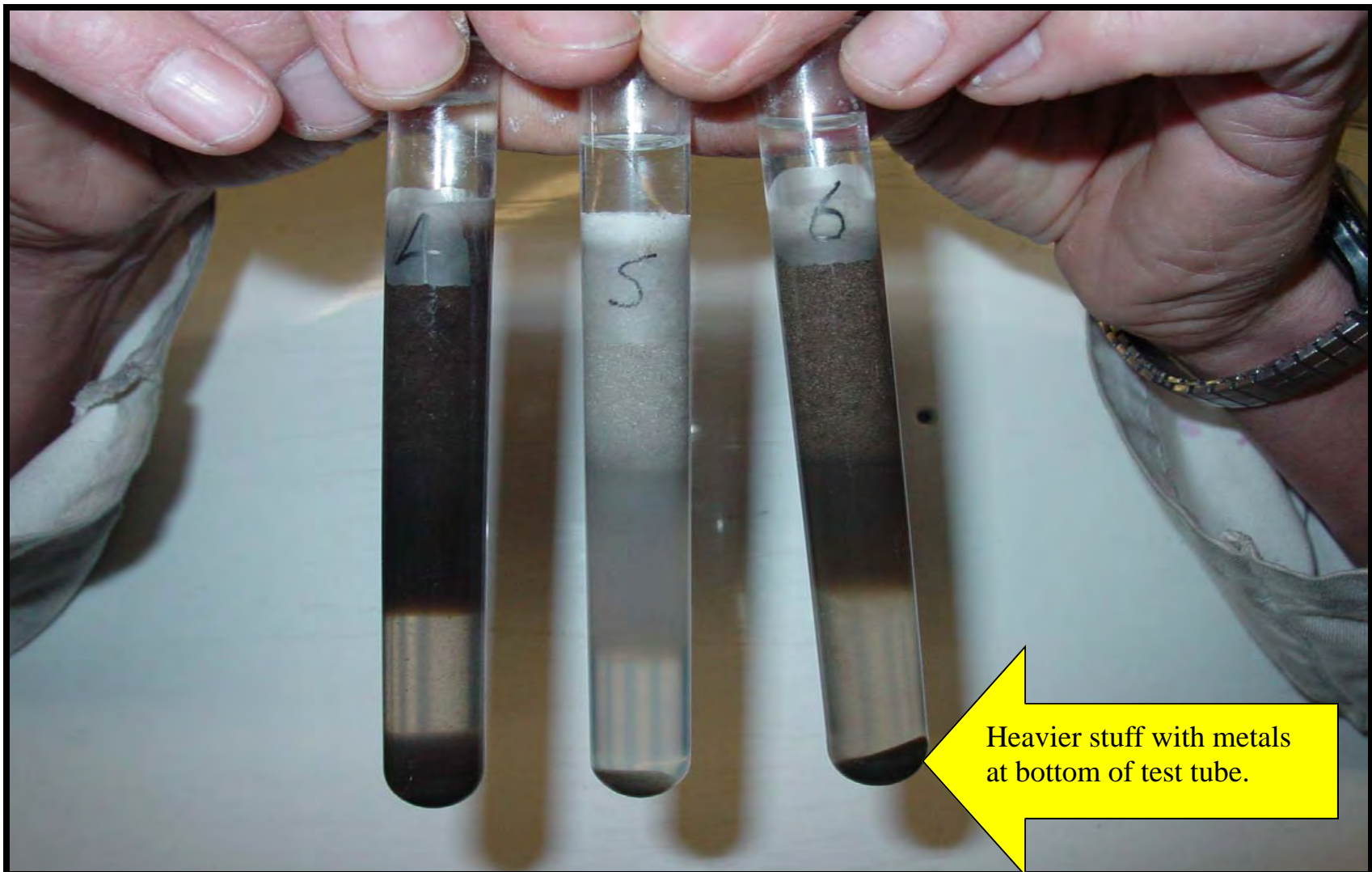
When a specimen goes through pyrite decay, the marcasite reacts with moisture in the air, the [sulfur](#) combining with water to produce [sulfuric acid](#) that attacks other sulfide minerals and mineral labels. It is most important to remove an afflicted specimen from other minerals to prevent this "disease" from spreading.

Some research has suggested bacteria may aid and accelerate this process by literally 'eating' the marcasite. What is known is that samples with a rough surface tend to decay faster than those with bright, shiny faces, probably due to the greater surface area to react with water in the air, and also it's clear that samples kept in a dry environment (low [humidity](#)) are less likely to decay.



Heavier stuff with metals
at bottom of test tube.

- 1 BNBM 3-22-09 date code. The original drywall was a very slight grey color. The drywall had no smell.
- 2 BNBM No date code. The original drywall was a white color. The drywall had no smell.
- 3 USG 1/2" Very white color. The drywall had no smell. Not much impurity at the bottom of the USG drywall. Very clean.



4 National Synthetic. Original drywall is grey in color. The original drywall had no smell. Bands are very dark in color.

5 Knauf Natural. Original drywall is very slightly grey in color. The drywall had no smell.

6 Knauf Tianjin. Drywall is grey in color. The drywall had a strong smell. Dark color to the bands.



Clearly no two samples have the same material composition based on this analysis. All have different fingerprints. The bands are different in size and the colors are different. Next we will look to see what is in each of the bands. Results expected next month(Dec. 2009)

- 1 BNBM 3-22-09 date code.
- 2 BNBM No date code.
- 3 USG 1/2"
- 4 National Synthetic.
- 5 Knauf Natural.
- 6 Knauf Tianjin.

Work being done under contract to Certified Mold Free Corp.
by Biostratigraphy.com, LLC



Marcasite