

The Spectrum of Pb: Lead Levels in Paint

LEVELS OF LEAD IN VARIOUS COLORS OF PAINT

Patricia Cleary, Michael Wenzel



University of Wisconsin
Eau Claire

ABSTRACT

- There is still wide-spread sales of lead based paint across Asia, Africa, Latin America, and Europe. Lead exposure accounted for almost half a million deaths in 2016, which is relatively the same as deaths due to tobacco smoke exposure. Lead based paint in homes is thought to be a major contributor to this problem. (Environmental International, pg. 1)
- The scope of this research is aimed to develop a method to obtain the lowest limit of detection for Pb on the Agilent 4200 microwave plasma atomic emission spectroscopy (MP-AES) and to determine Pb levels in paint based on the color and condition as well as soils that may have been contaminated with Pb by paint. Samples were taken from the same building, along with colored paint from different sources that were not currently obtained, and analyzed using analytical techniques on the MP-AES.

PURPOSE

There were several purposes for this research topic. One, use analytical methods and instrument parameters to obtain a limit of detection that is as low as possible. And two, determine Pb levels in paint and determine whether the color of the paint has an impact on Pb levels in paint. The third purpose was to see if Pb-based paint is a possible source of Pb contamination in soils around buildings.

METHODS

SAMPLING METHODOLOGY

Samples were selected by a non-probability technique, meaning they were chosen by convenience, accessibility and on a locations basis. Multiple samples were taken from the same building, and chosen by color and location in and outside the building. Samples were gathered in mass amounts incase multiple trials needed to be ran. Samples were collected to obtain as much pure paint as possible without having wood, drywall or other building material attach to them.

ANALYTICAL METHODOLOGY

Testing various parameters of the MP-AES along with concentrations of standards and the number of standards. Statistical analysis was used to determine confidence intervals and to determine which combination of parameters produced the lowest limit of detection.

RESULTS

LOD RESULTS

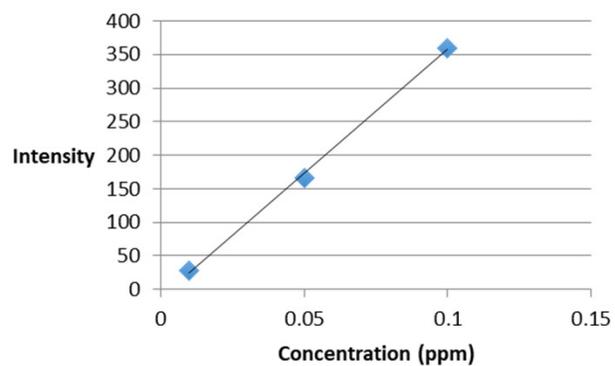
- Samples were analyzed using two wavelengths of 405nm and 368nm respectively. Lowering the concentrations of the standards to 0.01, 0.05, and 0.1 ppm had the largest impact on to the limit of detection (LOD) for both wavelengths. Increasing the nebulizer flow helped lower the LOD for the 405nm wavelength, and increasing the number of replicates to 7 lowered the LOD for the 368nm wavelength respectively.
- 368nm LOD = 0.0012ppm or 1.2ppb
 - ± 0.000773 ppm
- 405nm LOD = 0.0019ppm or 1.9ppb
 - ± 0.000812 ppm

Sample	Type	Pb Conc. Range (mg/kg)
01	Paint (Red)	0
02	Paint (White)	1.85 - 1.90
03	Paint (white)	160 - 164
04	Soil	73.8 - 75.2
05	Paint (White)	1241 - 1268
06	Soil	0
07	Soil	0
08	Soil	64.8 - 66.1
09	Paint (Yellow)	0
10	Paint (White)	5157 - 5282
11	Paint (white)	57994 - 58962

PAINT RESULTS

- Pb concentration ranges are shown in the table above. The results found were not as expected. It was expected that colored paints would have higher levels of Pb than white paint because of CrPbO4 used to give the paint its color. This was not the case, all of the white paints analyzed had higher levels of Pb than any of the other colored paints.
- This gives reason to believe that the age of the paint has a larger impact on Pb levels than the color does, since these were the two factors believed to have the largest significance in paint Pb concentrations.
- Paint exceeding 200ppm is deemed hazardous by the EPA and three of the paint samples (all white paint) exceed this mark and therefore, are hazardous to the environment.

368nm Wavelength



REFERENCES

1. United States, Congress, Prevention, Pesticides, and Toxic Substances. "Pb-Based Paint Laboratory Operations Guidelines: Analysis of Pb in Paint, Dust, and Soil." 1993.
2. Silva, FL; Duarte, TOA; Melo, LS; Ribeiro, LPD; Gouveia, ST; Lopes, GS; Matos, WO. "Development of a wet digestion method for paints for the determination of metals and metalloids using inductively coupled plasma optical emission spectrometry." 2016.
3. White, K; Detherage, T; Verellen, M; Tully, J; Krekeler, MPS. "An investigation of lead chromate (crocoite-PbCrO4) and other inorganic pigments in aged tragic paint samples from Hamilton, Ohio: implications for lead in the environment. 2014.

