

Lead and Aluminum Concentrations in Organic Red and Black Tattoo Inks



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ABSTRACT

The art of tattooing has been prevalent in nearly every culture for thousands of years. Although, regulations are still missing. The United States Food and Drug Administration has tattoo ink classified as cosmetic but does not approve of the injection of the ink into the dermis. The presence of lead and aluminum in these inks has received attention due to the correlation between metal exposure and the exacerbation of various forms of allergic reactions and systemic infections (e.g., dermatitis). Inductively-coupled plasma - optical emission spectrometry (ICP-OES) was employed to analyze two, top-brand tattoo inks and to determine the presence of toxic metals in the samples. Aluminum was detected in both colors of Dynamic Color Company's Ink. Higher levels of aluminum concentration were detected in the black ink when compared to the red (nearly double the concentration). The concentration of lead was negligible in both colors of ink. As high levels and long-term exposure of aluminum and lead pose significant health concerns, these findings have the potential to inform professional tattoo artists and consumers decisions regarding ink products best for their health and safety.

OBJECTIVES

To measure the concentration of lead and aluminum in organic red and black tattoo inks using inductively-coupled plasma - optical emission spectrometry (ICP-OES) and verify if the brand is organic.

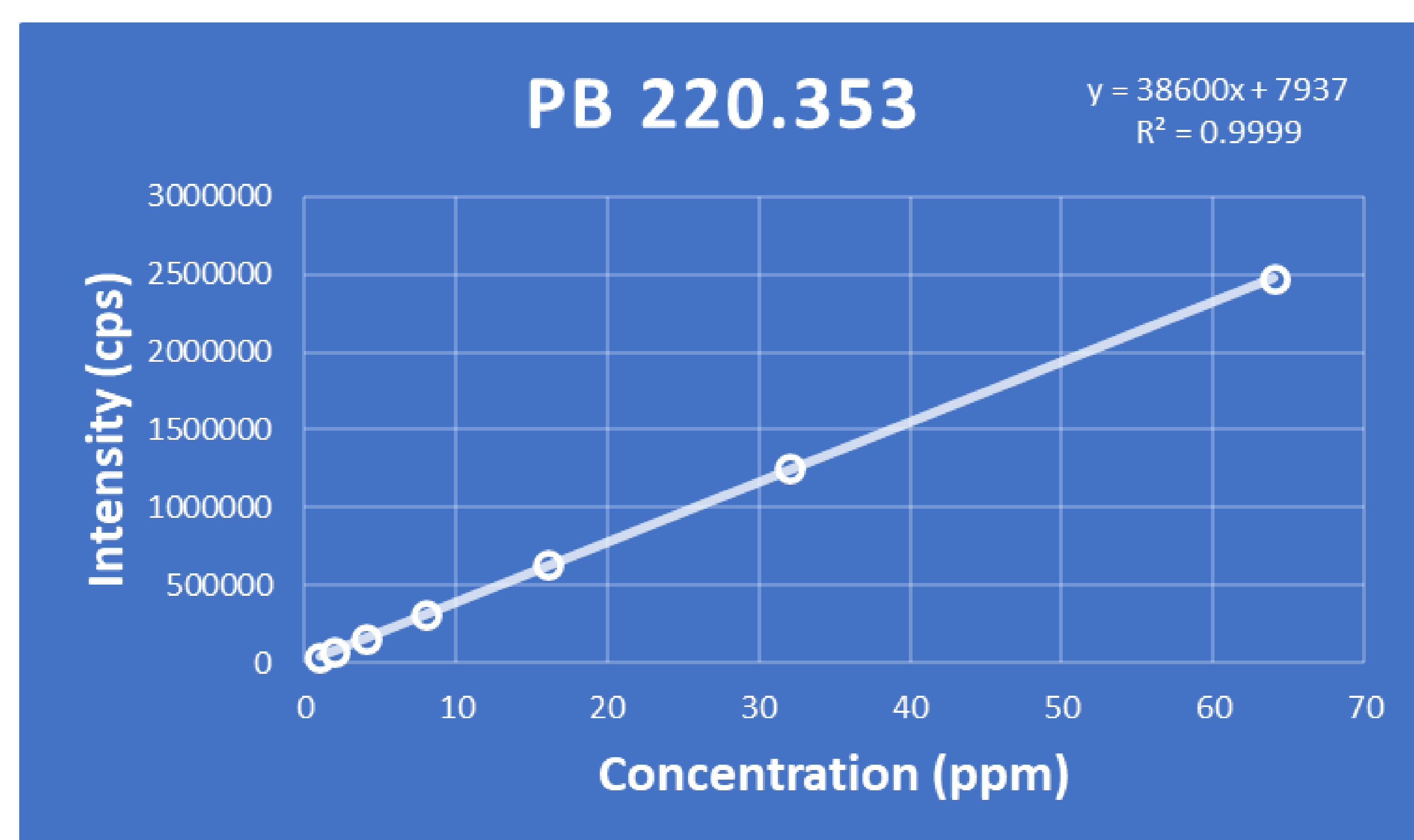
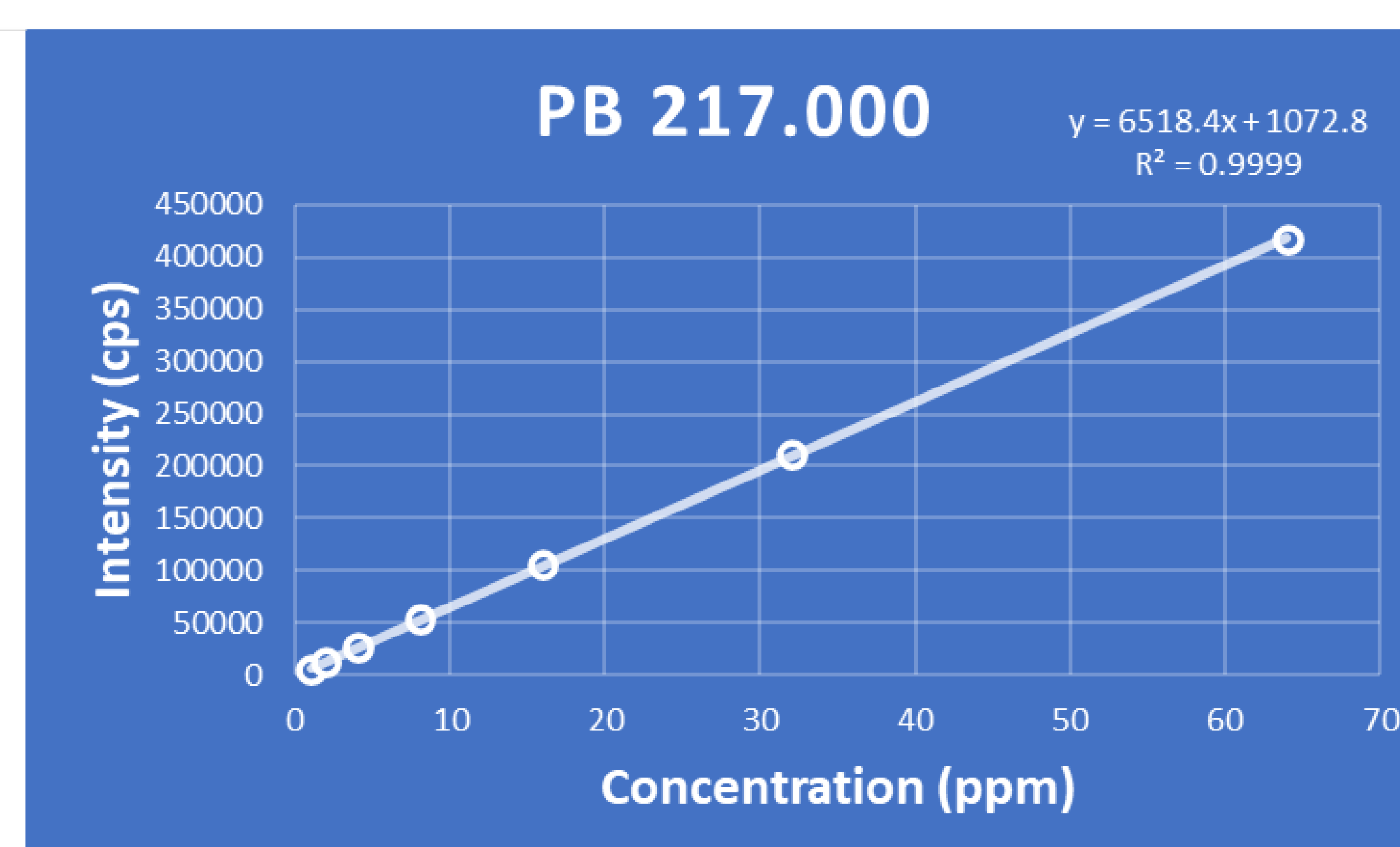
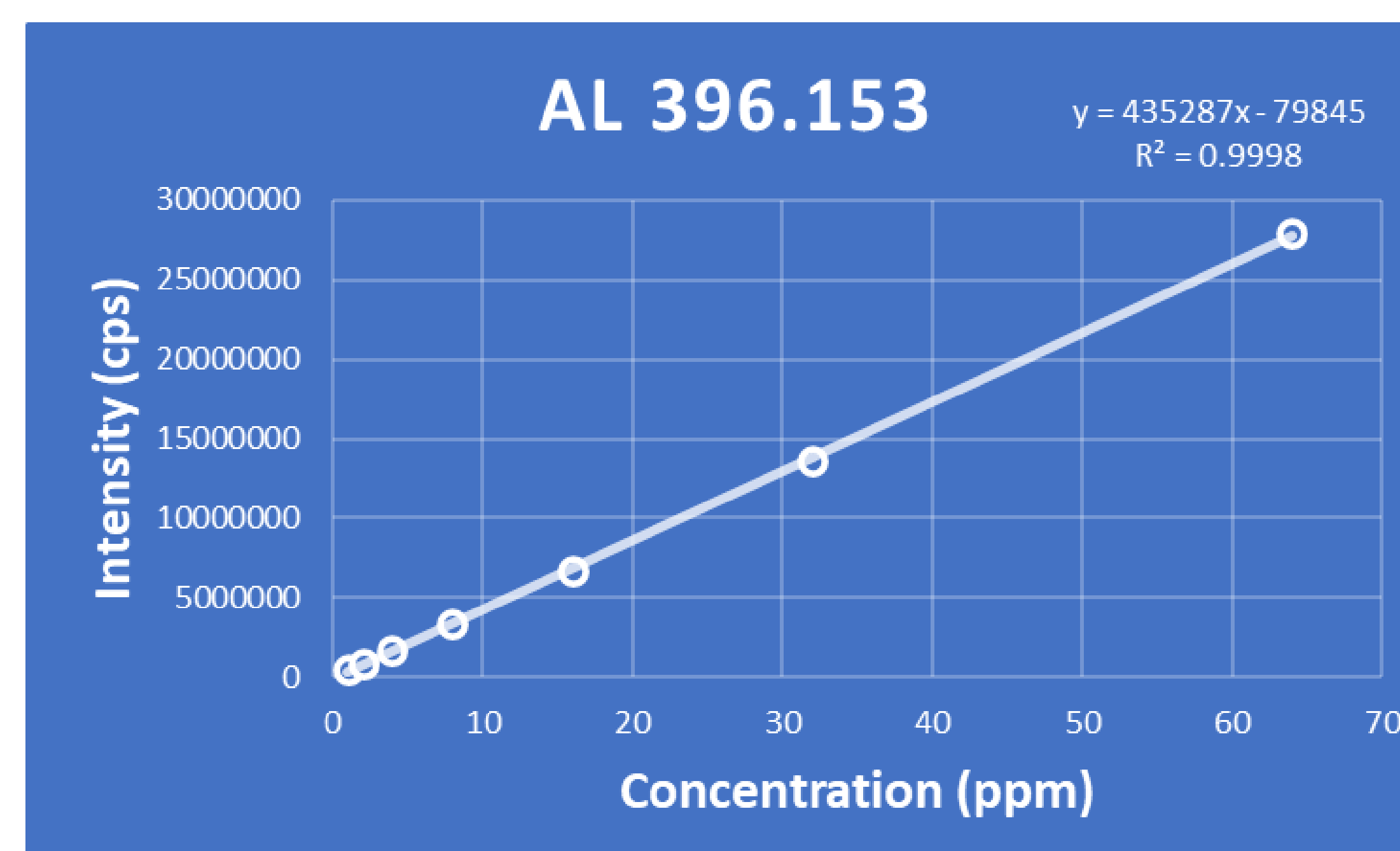
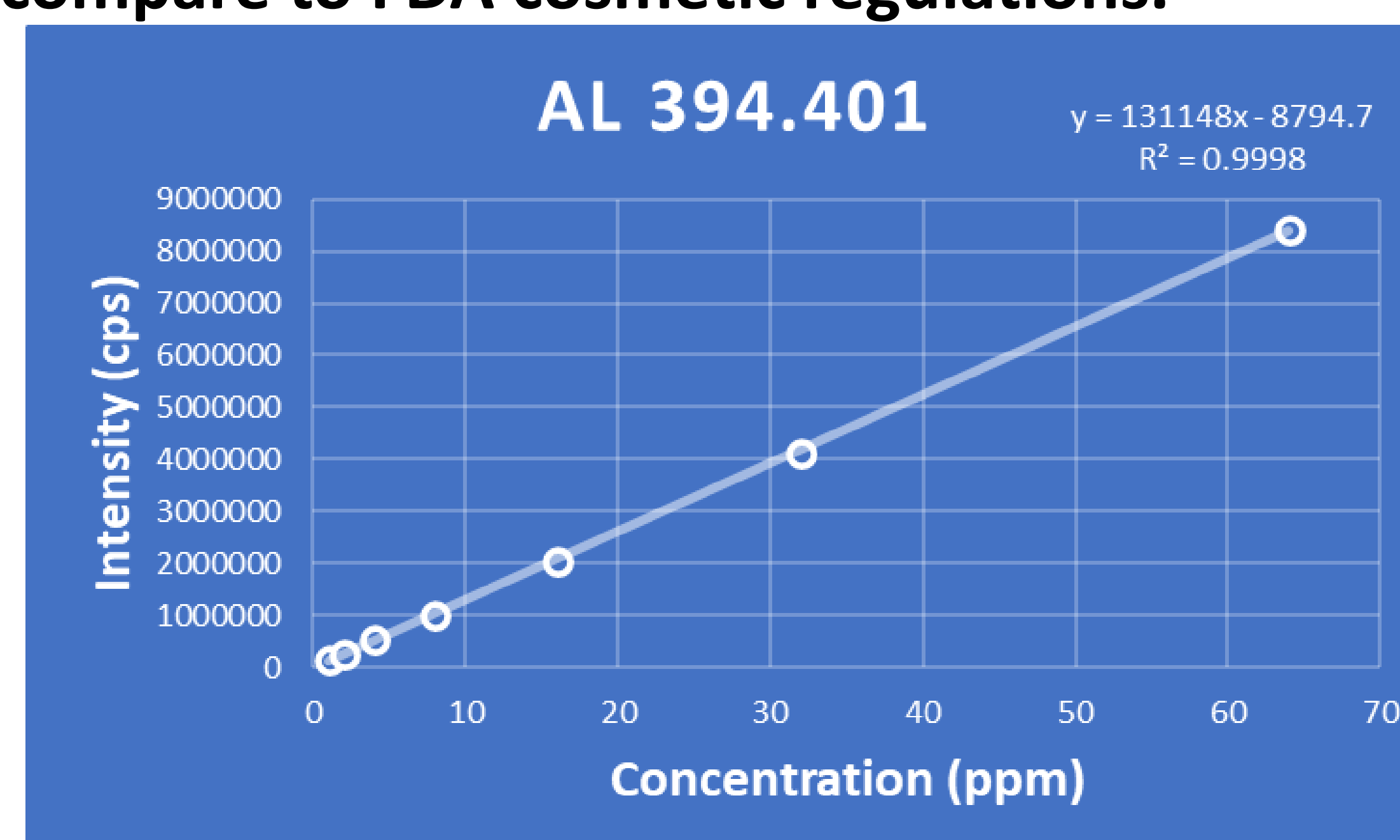


Figure 1. Calibration curves for lead and aluminum.

METHODS

- § 7 standards were created for both aluminum and lead from a stock solution of 250ppm for aluminum and 250ppm for lead, and ran through ICP-OES.
- § The mass of 0.5607 g aluminum and 0.1951 g lead was measured and dissolved in 2% Nitric Acid to create stock solutions.
- § 20mL of 30% Nitric Acid are added to the samples (i.e. unspiked, spiked with Pb or Al) and put on shaker for 30 minutes.
- § The samples were vacuum filtered to separate the solids from the liquids.
- § Samples were then centrifuged at a speed of 3500 rpm
- § Samples were syringe filtered and then decanted into 100mL volumetric flasks for ICP-OES.
- § Use Excel to determine concentrations, MDL, and to compare to FDA cosmetic regulations.



RESULTS

- The results from our last trial yielded are that the amounts of Pb/Al were small enough that the brand Dynamic Ink can be classified as organic. We found that is accurate this time around as well.
- FDA daily ingested limit for Pb is 12.5 micrograms.
- FDA daily ingested limit for Al is 25 micrograms.
- Our percent recovery from last trial was very low due to over-filtrating. This trial's recovery was higher due to not filtering our samples as much in hopes of getting better results.

Final Concentrations [$\mu\text{g/L}$]			
Pb 220	Pb 217	Al 396	Al 394
0	0	0.000379	0.000281
0	0	0.006665	0.00075

Percent Recovery			
Red Pb	Black Pb	Red Al	Black Al
90%	85%	90%	98%

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