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RE: RECOMMENDED ELEMENTAL ANALYSIS TECHNIQUES FOR PRODUCT TESTING
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While some states are taking a great first step in passing laws to restrict the concentrations of specific substances in products, the methods and requirements test to compliance have not yet been well considered. Many of these laws, including the Washington State Children's Safe Product Act, specify maximum concentrations both of elements (such as cadmium or lead) as well as plasticizers (such as phthalates). Rigorous testing for complex molecules like phthalates is an involved and generally destructive process (with the exception of FT-IR methods), but elemental testing for lead and cadmium can be fast and portable.

The current trend in elemental testing is to use handheld x-ray fluorescence (XRF) spectrometers. These devices are used in industrial settings around the world as well as by multiple branches of the U.S. government including the EPA. The testing thresholds for heavy elements such as cadmium and lead are well below the limits stated by law (for example, the CPSC's 16 CFR 1303 bans lead in excess of 600 parts-per-million (ppm) and the Children's Safe Product Act will specify a 40 ppm maximum while most handheld XRF devices comfortably measure down to 5 ppm with great certainty). There are more precise techniques available, but these do not provide any advantages based on the scope of current law drafts.

Stationary, research-grade XRF units are much more sensitive than their low-power handheld counterparts, but this affords no advantages when we consider the relatively high levels of interest from a legal standpoint. In addition, the devices accept only a small part of the product so the testing is destructive. These machines are typically so large as to be immobile and are very expensive to purchase and run, costing at minimum ten times what a top-shelf hand-held unit does. These added costs would limit the number of toys which are tested and hence either compromise customer safety by letting products slip through untested or put undue stress on small-business companies that cannot otherwise afford to have their products tested. Testing by handheld XRF deftly avoids both these outcomes.

There are other methods of elemental analysis besides x-ray fluorescence, of course. Most of these are based on x-ray techniques (such as energy dispersive spectroscopy) but all generally require bulky standalone machines that have additional limitations such as sensitivity to surface roughness or the requirement of a vacuum. Another technique is mass spectroscopy, but while this method can analyze samples on a molecular as well as elemental level, it is the most difficult to perform in a quantitative manner when compared with the other techniques discussed previously.

Thus, the handheld x-ray fluorescence spectrometer is ideally suited for at the very least screening for compliance with these new laws. These devices are more than capable of testing to the limits defined by law and are inexpensive enough so as to ensure that the testing is available to all manufacturers, retailers, and individuals. Because the most important part of any law is enforcement, we have to make sure that this testing is available to everyone.

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