

Comparative Household Chemical Analysis Using Ambient Ionization Coupled to Miniature Mass Spectrometry

STUDENT AWARD WINNER

Christopher Pulliam, Joshua S Wiley, and R. Graham Cooks

Department of Chemistry, Purdue University, West Lafayette IN 47907

Household chemical products are manufactured for the purpose of dispersal over our homes and gardens. We polish furniture, clean glass, remove carpet stains, and kill insects with these complex chemical mixtures and give little thought to how they may enter our bodies simply by breathing or touching the treated surfaces. In this study low-temperature plasma (LTP), desorption electrospray ionization (DESI), and paper spray/leaf spray ionization – all ambient ionization methods used on the native samples in situ - are used with tandem mass spectrometry on a miniature mass spectrometer to analyze various surfaces. The characteristics of bulk solutions of various household chemicals ranging from candles to dehumidifiers to herbicides have been determined. The high vapor pressure of typical analytes makes LTP ionization highly amenable to their detection when coupled to a miniature mass spectrometer. The portability and robustness of the miniature mass spectrometer (Mini 10.5) and the LTP ionization method facilitates chemical analysis outside of the laboratory. (DESI coupled with the mini MS is more difficult to perform in a portable fashion due to the relative large amounts of solvents and the miniature vacuum pump.) Figures of merit of the ambient methods of the ambient ionization techniques will be presented as well the common ingredients detected in the household chemicals and lawn chemicals. The compounds present are confirmed by MSⁿ experiments done using the miniature mass spectrometer. Application of direct leaf spray to treated lawns is a highlight of this work.