

## Problem:

- 2007: Melamine intentionally added to pet food led to the death of 244 pets in the United States.
- 2008: Melamine intentionally added to milk resulted in 53,000 hospitalizations in China.
- 2010: Melamine contaminated food seized by Chinese authorities.
- Today: baby formula, chicken, dairy products (milk), eggs, farmed fish, pork and pet food, must be tested for melamine.

## Need:

- Rapid method to detect melamine at 1 to 5 parts-per-million (mg/kg).

## Solution:

- The **Chemical Residue Detector** can detect and identify melamine at 1 to 5 ppm in food in < 10 minutes.
- The **Chemical Residue Detector** is the first hand-held analyzer that employs surface-enhanced Raman spectroscopy (SERS) to detect and identify trace chemicals in the lab or the field (Figure 1).
- The patented **Simple SERS Sample Vials** and Capillaries enhance the Raman scattering efficiency of chemicals by a million times or more allowing trace chemical detection, such as melamine (Figure 2).
- The **Chemical Residue Detector** can detect and identify melamine at < 1 ppm in milk (Figure 3).<sup>1</sup>
- The **Chemical Residue Detector** can detect and identify melamine at 1 ppm in baby formula (Figure 4).



Figure 1. **Chemical Residue Detector**.

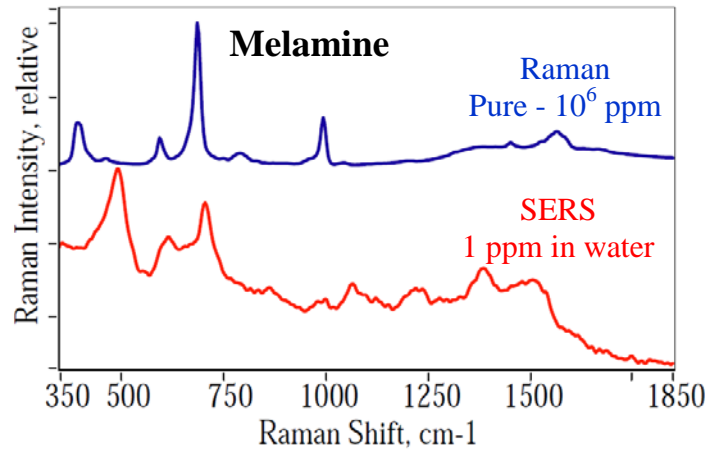


Figure 2. Raman and SERS of Melamine. **Simple SERS Sample Vials** enhance signal ~ 1 million times.

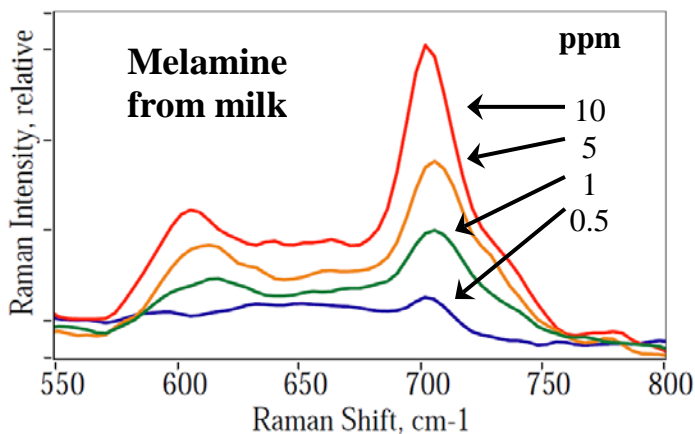


Figure 3. SERS of Melamine extracted from milk. Measured in 10 minutes.

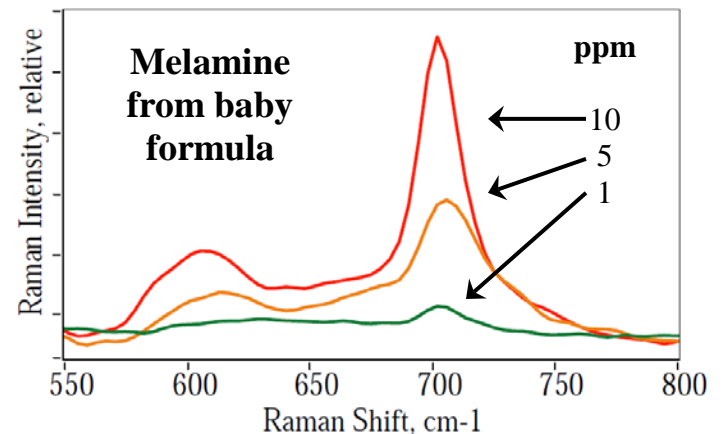


Figure 4. SERS of Melamine extracted from baby formula. Measured in 10 minutes.

1. "Field analyzer for melamine analysis" Sensors & Instruments for Food Quality, in preparation.

**Problem:**

- 5% of imported fruit contains pesticides exceeding safety limits.
- Most pesticides are organophosphates that pose a threat to human health.
- A large percentage of the fruit is used in baby food and juices.
- Less than 1% of imported food is tested for pesticides, since it takes hours to perform.

**Need:**

- Rapid method to detect pesticides at 0.01 to 5 parts-per-million (mg/kg).

**Solution:**

- The **Chemical Residue Detector** can detect and identify pesticide at 0.01 ppm in juices in < 10 minutes.
- Every pesticide has a unique Raman and SERS signature that allows a positive match, and therefore a positive identification (Figure 5).
- The **Chemical Residue Detector** measures the SERS spectral signature of an unknown sample, matches it to one of 50 SERS pesticide signatures stored in memory (spectral library), and displays the unknown identity (chlorpyrifos).
- The **Chemical Residue Detector** has been used to measure chlorpyrifos in orange juice, a pesticide widely used to kill pests on trees (Figure 6 and 7), at 0.05 ppm (50 parts-per-billion).<sup>2</sup>

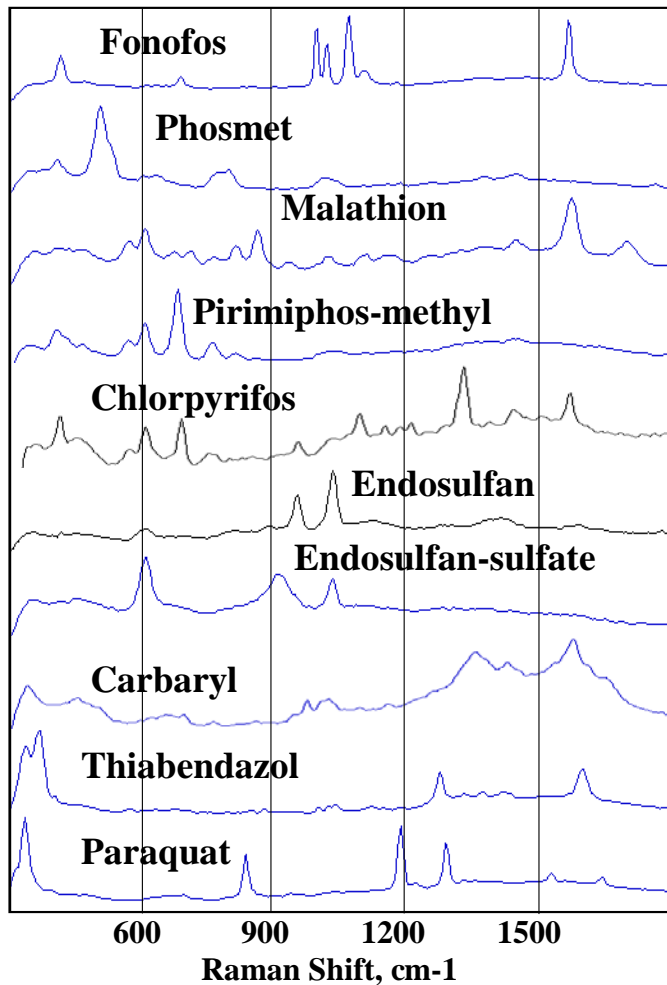


Figure 5. SERS of 10 pesticides all measured at 0.01 parts-per-million. Measured in 3 minutes.

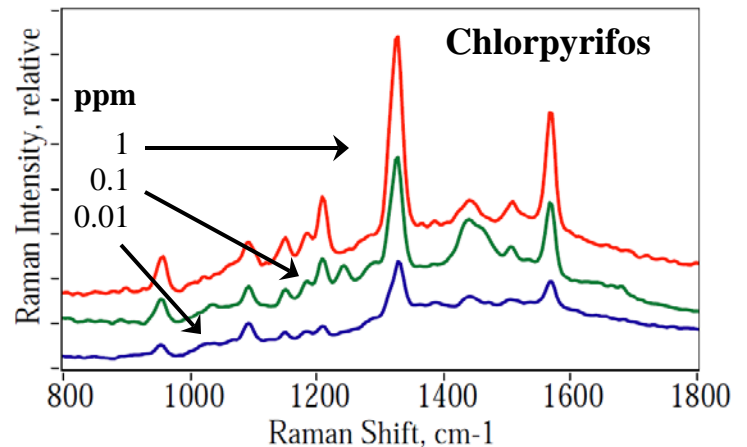


Figure 6. SERS of Chlorpyrifos in water. Measured in 1 minute.

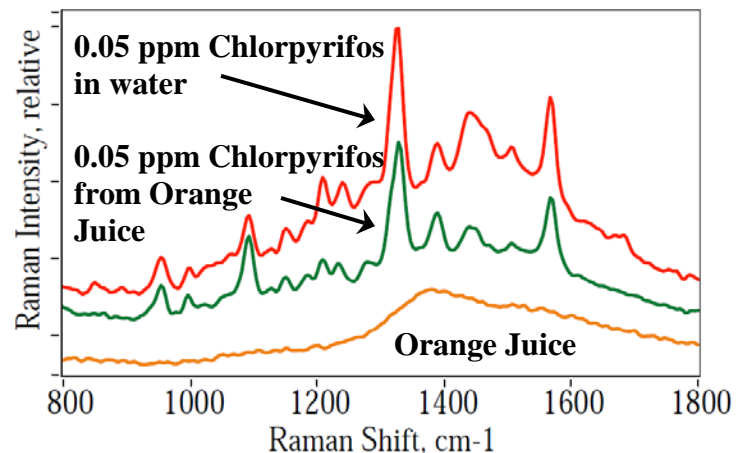


Figure 7. SERS of Chlorpyrifos extracted from Orange Juice. Measured in 10 minutes.

2. "Rapid extraction and detection of trace Chlorpyrifos in orange juice by SERS" Sensors & Instruments for Food Quality, on-line Oct, 2010. RTA is located at 362 Industrial Park Rd (#8) / Middletown, CT 06457 [www.rta.biz](http://www.rta.biz), Phone: 860-635-9800, Facsimile: 860-635-9804