

# Application of Near-Infrared Spectroscopy (NIRS) Technology to detect food frauds

UAB

Universitat Autònoma  
de Barcelona

Allison D. Zambrano Olarte

Food science and technology

2014-2015

## Introduction

Infrared spectroscopy (IR) is conventionally divided into three wavelength regions: the near-infrared (NIR: 700–2500 nm), mid-infrared (MIR: 2500–25 000 nm), and far-infrared (25–1000  $\mu\text{m}$ ) (Figure 1).

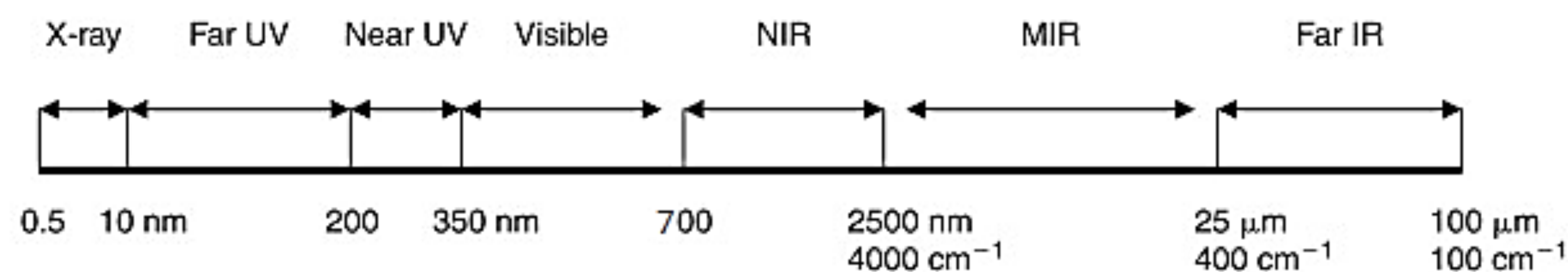


Figure 1: Spectral regions of interest for analytical purposes. Sun (2004).

**NIRS Technology** has the ability to provide information about the **composition of a sample**.

**OBJECTIVE:** To expose the advantages of the application of the NIRS technology to detect food fraud

## Near-Infrared Spectroscopy Technology

When the molecules are irradiated with NIR these absorb a part of the energy. The other part of radiation is reflected and a **reflectance spectrum** is obtained.

- Every sample has a specific reflectance spectrum (Figure 2).
- The reflectance spectrum depends on the sample composition

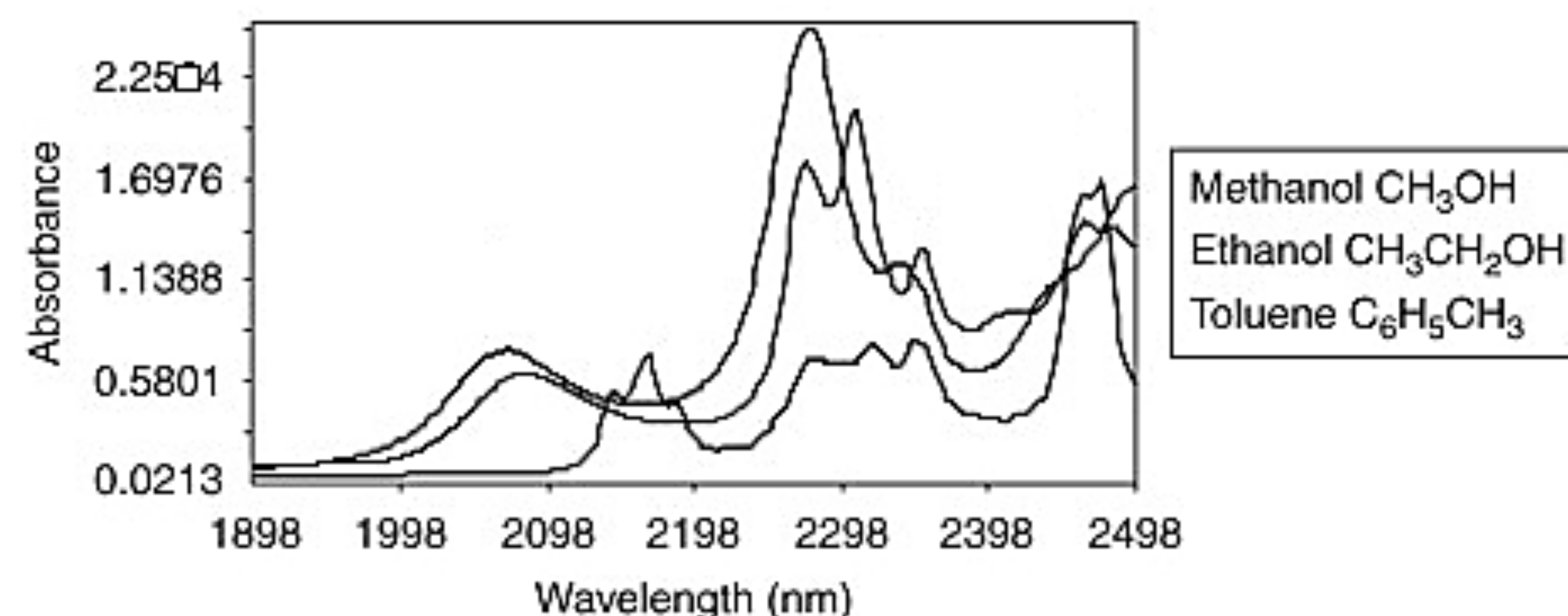


Figure 2: Spectra of ethanol, methanol and toluene in the NIR region between 1900 and 2500 nm. Sun (2004).

## Near-Infrared Spectroscopy and Food Fraud

### DAIRY SECTOR

Adulteration of milk and infant formula with **melamine** in China (Figure 3).

### OILS AND FATS SECTOR

Toxic oil syndrome in Spain.

### MEAT SECTOR

Horsemeat scandal in Europe.

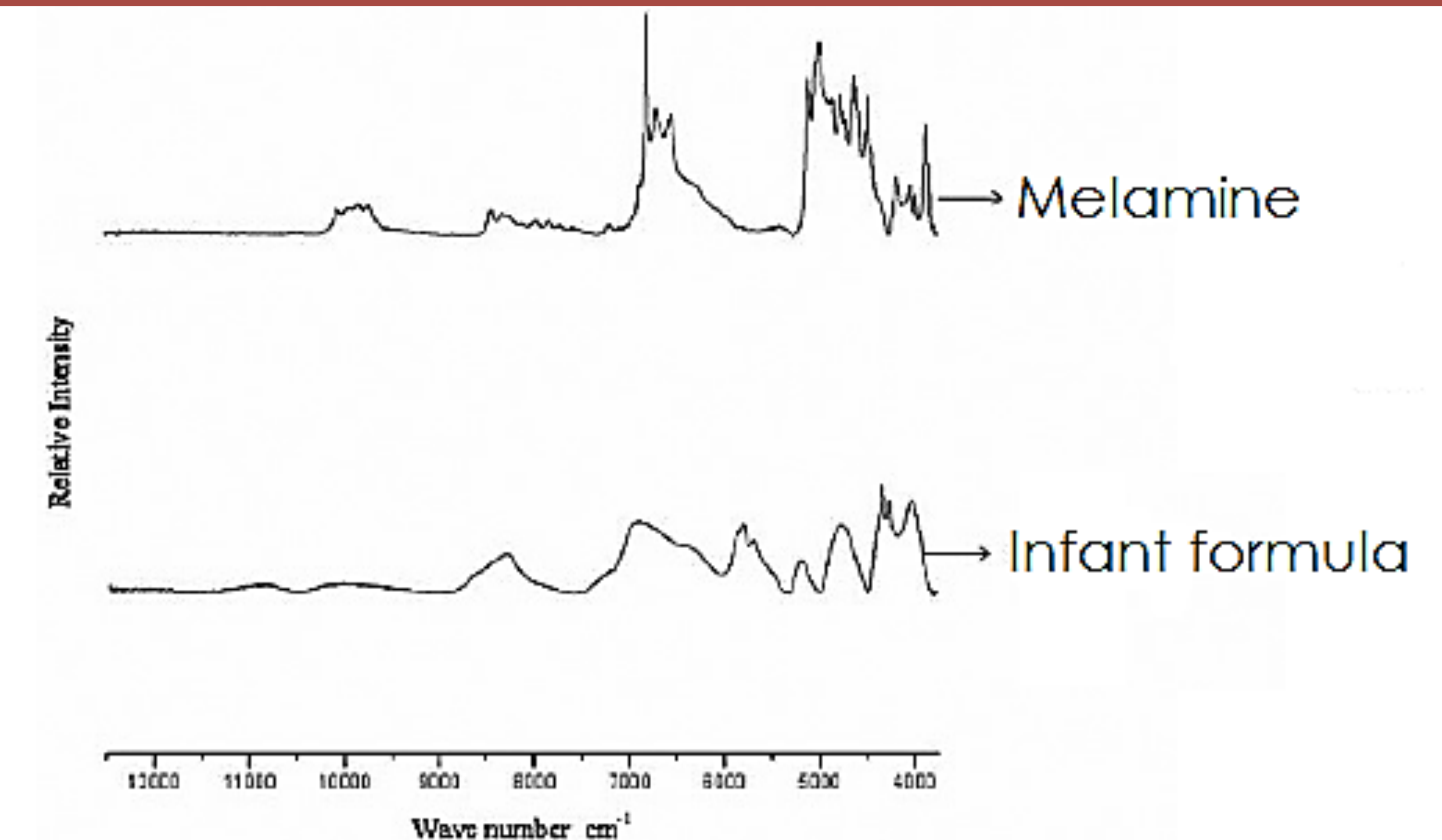


Figure 3: NIR absorption spectra of melamine and infant formula powder. Tiziana and Holroyd (2013).

## Advantages

Regarding the sample:

- **MULTI PRODUCT**
- **NON-DESTRUCTIVE** (Figure 4).

Related to the information that it provides:

- IT **PROVIDES CHEMICAL, PHYSICAL AND SENSORY** features
- IT IS **MULTI-CONSTITUENT**

Compared with other methods of analysis:

- **NON-POLLUTING**
- IT IS **FAST**
- IT IS **CHEAP**



Figure 4: Analysis of intact apples. NIRsolutions ,S.L

## Conclusions

- ✓ NIRS Technology allows to perform qualitative analysis in order to detect food fraud.
- ✓ NIRS advantages offer a competitive technique against traditional methods.

### References

Ares, J.L., Moreno, N., Garrido, Ana., Serradilla, J.M. 2004. *Aplicación de La Tecnología NIRS Para La Detección de Mezclas En Leche Y Queso de Cabra*. 1ª Edición. Junta de Andalucía, Andalucía. pp: 209.  
Sun, D. 2009. *Infrared Spectroscopy for Food Quality Analysis and Control*. Elsevier, Dublín. pp:448.