

Near-Infrared (NIR) Spectroscopy

Introduction

- **General information:**
 - **Weight:** 2.75 lb or 1.2 kg
 - **Approximate cost:** ~ 50 K (US \$)
 - **Calibration using USP <1119> with traceable wavelength standards**
 - **Measurement time:** < 1 minute
 - **Battery life:** ~ 6 hours (rechargeable and interchangeable)



How it works

- **Explain how the technology works:**
 - **The technique employs Near-Infrared (NIR) light source to get chemical and physical fingerprint information (only between 1600 – 2400 nm, combination and first overtones)**
 - **Sampling mode: Diffused Reflectance**
 - **Optional adapters for liquids available**

Strengths

- **Include three strengths of the technology:**
 - **Rapid analysis**
 - **Easy to transport**
 - **Non-destructive**
 - **Can provide quantitative information if proper calibration model is developed and validated**

Limitations

- **Include three limitations of the technology:**
 - **A bit of steep learning curve to develop methods (PCA, PLS etc.)**
 - **Physical characteristics differences can influence the analysis**
 - **Generally not used for liquids**
 - **Unit is sensitive to shake during measurement**

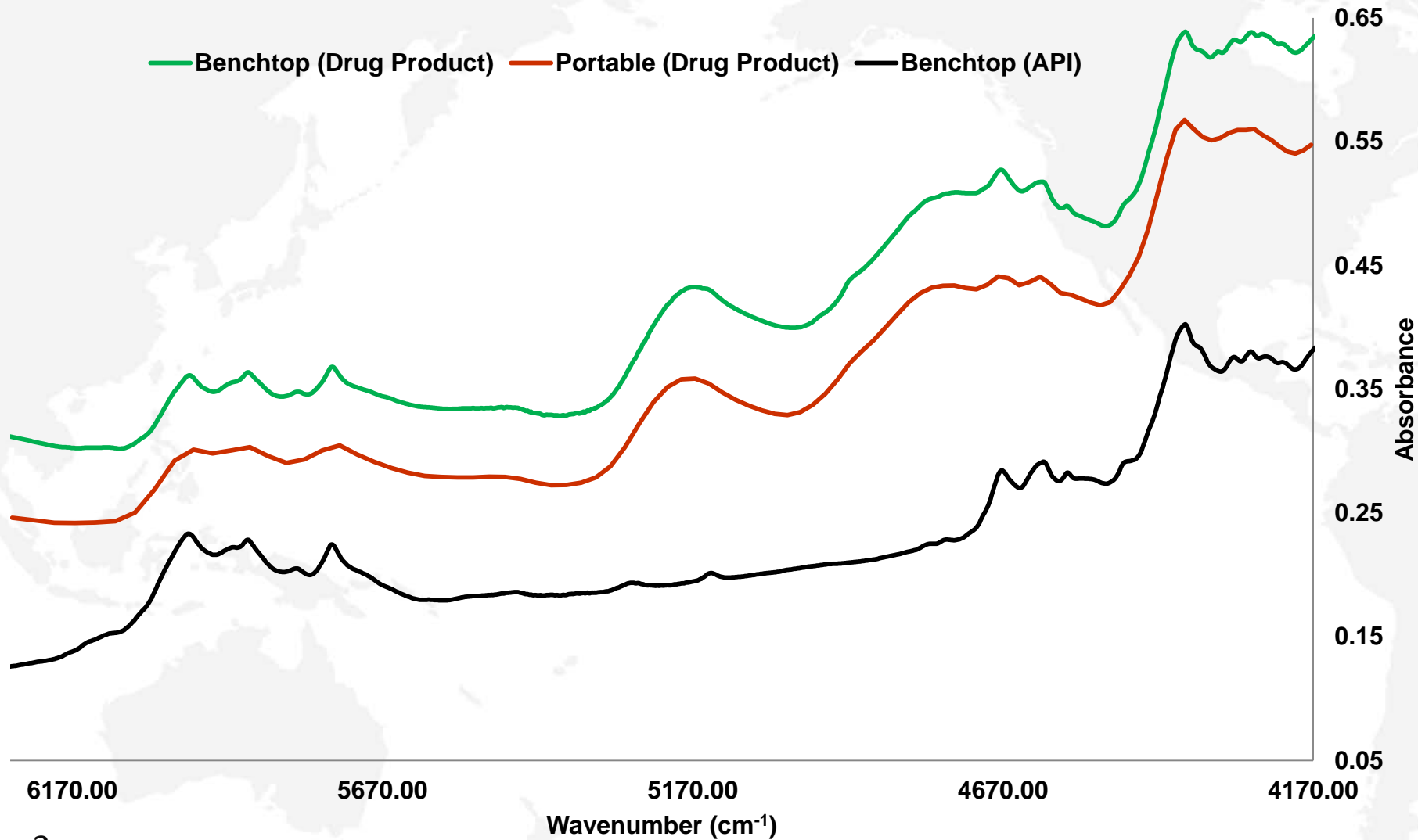
Why Portable?

Raman

- Take the laboratory to the crime scene
- No need to ship samples to a testing laboratory which means, no customs or FDA clearance needed
- Allow instant, remote detection of counterfeits
- Surveillance and monitoring of pharmacies, hospitals and manufacturing facilities and rapid screening of products
- Facilitate quicker identification and arrest of criminals
- Proactive approach and not reactive
- Save time and cost

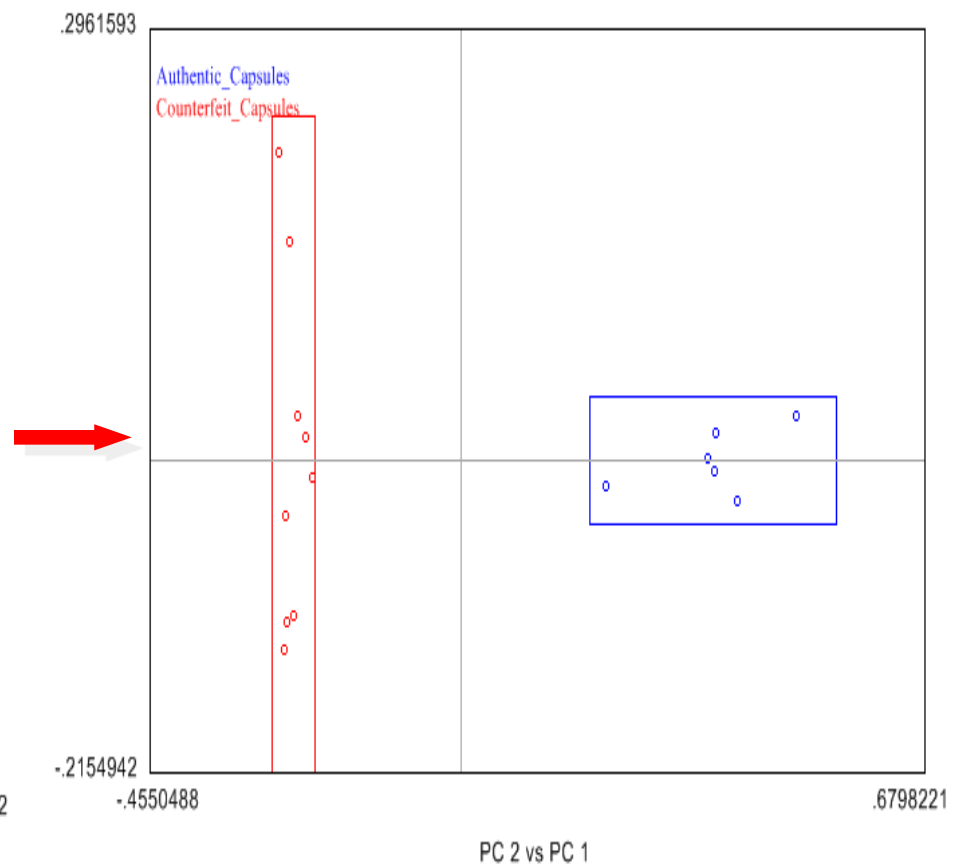
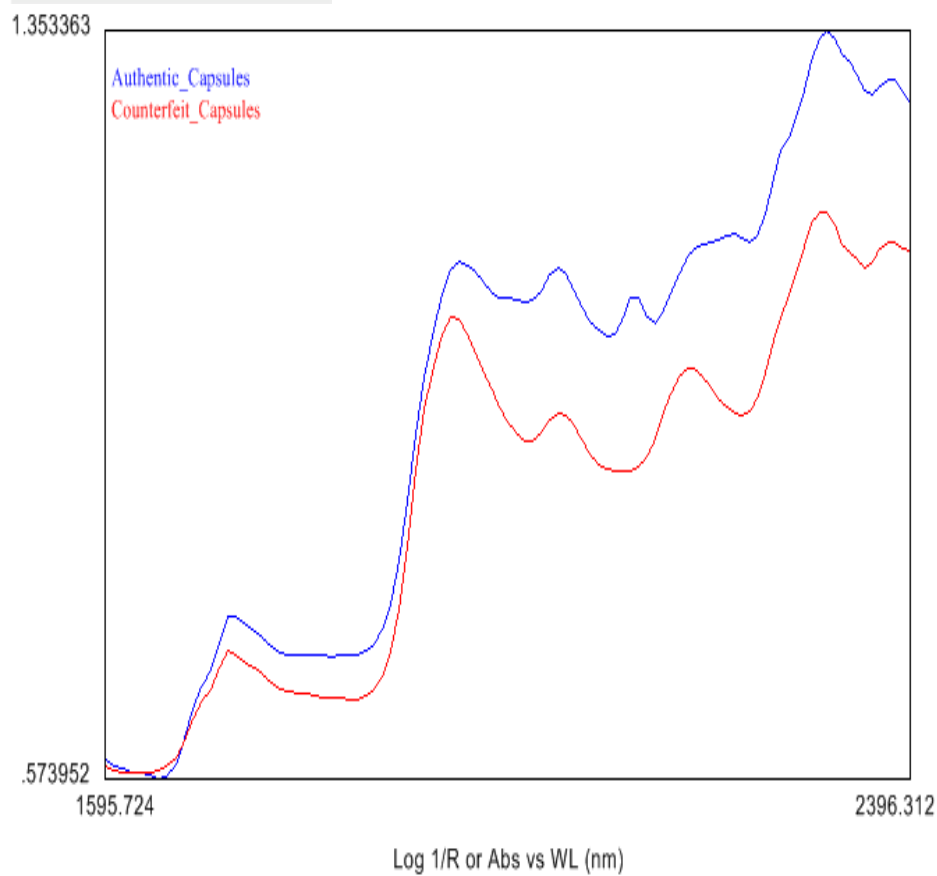


Portable vs. Benchtop (NIR)





Analysis of Counterfeit Capsule A



Counterfeit Capsule B



- Product supposed to contain two active ingredients
- Handheld NIR and Raman spectra revealed that it contained no active ingredients
- The spectral results matched with **calcium carbonate (chalk!!)**
- Runtime less than a minute!

NIR Analysis of Counterfeit Tablet

