



Benefits of Vanta™ XRF Analyzers

Vanta handheld XRF analyzers enable you to analyze a range of materials quickly and nondestructively in the field. Benefits include:

-  Continuous operation at high temperatures: Up to 50 °C (122 °F)
-  IP55/IP54 rated: Withstands dirt, dust, and rain to protect against hazards in challenging environments
-  Drop tested (MIL-STD-810G): Protects against falls and reduces the need for costly repairs
-  Cloud-technology enabled: Access and share data across multiple platforms from any location

Application Notes

Portable XRF and XRD for Security, Forensics, and Customs Applications

Olympus portable XRF and XRD analyzers help law enforcement and customs agencies by providing fast, nondestructive chemical and compound quantitative analysis for a range of sample types, including powders, solids, and liquids. This information enables important decisions to be made in real-time, in the field.

Explosives and Narcotics Precursor Materials

Clandestine labs producing illicit drugs and explosives use a range of precursor materials, including pure phosphorous, iodine, magnesium, sulfur, and aluminum.

For investigators, it is important to be able to identify these materials on-site; however, the highly combustible nature of these materials means that they cannot be safely analyzed using technologies with a heat source. As a result, investigators may not have any knowledge about the composition of these materials until they receive results from the laboratory—a process that typically takes weeks to months.

Vanta portable XRF (pXRF) analyzers provide a nondestructive chemical analysis of these precursor materials in seconds. Without a heat source, pXRF is also safer than other techniques used on explosives. This method provides investigator and forensics professionals with important information on-site to speed up the decision-making process.

Analysis of Bullets and Gunshot Residue

Vanta pXRF can be used directly on alloys to provide a quick alloy ID. This capability is particularly helpful for investigators since ammunition can vary significantly in the elemental composition of the projectile, which can lead to a substantial change in residue. Also, the casing or jacket alloys varies between countries and manufacturers. pXRF provides a rapid method for analysis of projectile and jacket alloy materials so investigators can differentiate the manufacturer.

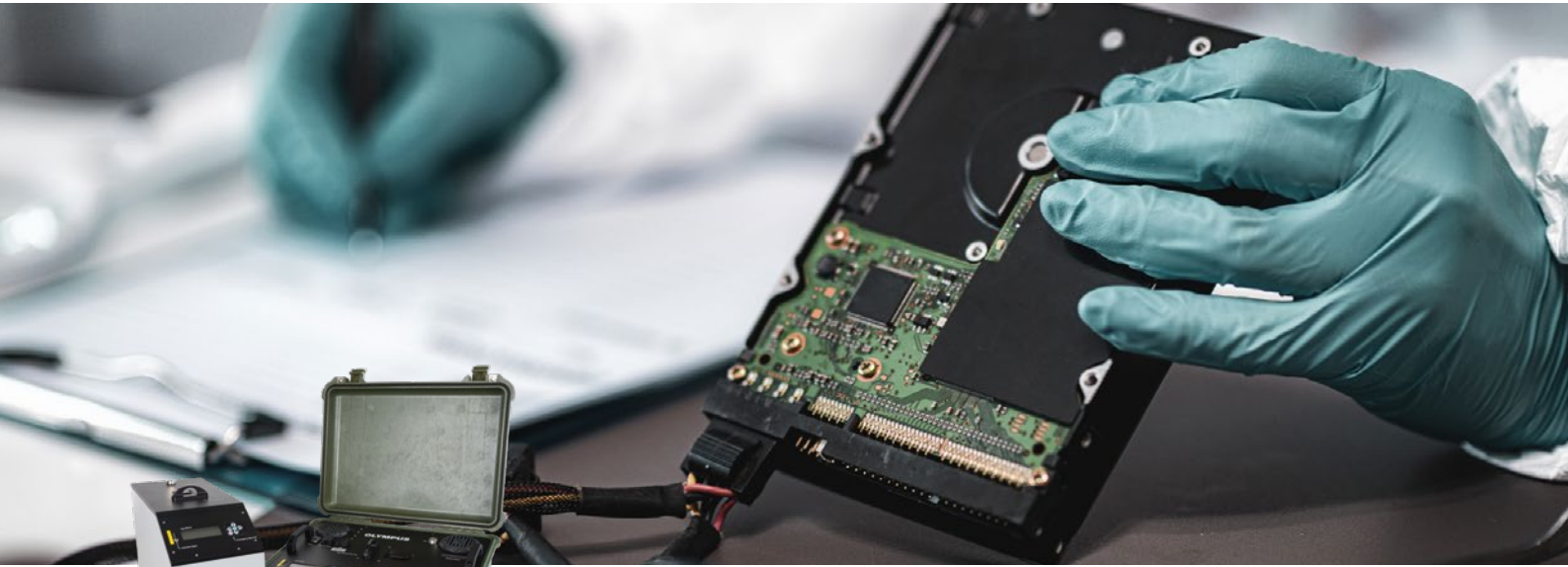
Gunshot residue (GSR) is commonly composed of barium, lead, and antimony as the major elemental ingredients. Vanta pXRF can be used to quickly and nondestructively screen materials believed to have been exposed to GSR (e.g., carpet, clothes, glass, and floors).



Precious Metals

Precious metals such as gold, silver, platinum, palladium, and rhodium are attractive to criminal enterprises as they provide a vehicle for laundering money. There is also an element of anonymity with gold, which makes it difficult to track its origins.

Vanta pXRF provides customs and law enforcement agencies with a rapid method for determining the composition of precious metals on-site. This includes coins, jewelry, bullion bars, and even consumer goods. It can also be used on powdered material such as soil, gold, impregnated carbon, car catalyst mix, and recycled electronics, which may contain precious metals that would otherwise go undetected. This fast analysis can help to uncover attempts of unlawful organizations working to smuggle precious metals between borders.



Olympus XRD for Explosives, Narcotics, and Customs



Small Sample: Requires only 15 mg of sample



Easy Sample Prep: Does not require a skilled technician



Fast Acquisition Time: Obtain results in only a few minutes



Stand-Alone Instrument: No need for water cooling or a large, external power source



No Ongoing Servicing Requirements: XRD can be performed regularly with minimal downtime



Portable: Battery operated, rugged design with no moving parts



Qualitative XRF: Measured simultaneously during each test

Olympus XRD analyzers aid law enforcement agencies by providing qualitative and quantitative phase analysis on a range of substances, including narcotics, explosives/hazardous materials, and materials analyzed by forensics and customs officials. The unique sample handling system enables our instruments to be transported easily between sites while eliminating the need for complicated sample prep procedures.

Flexible Sample Loading Options

At Olympus, we realize that with different applications, there is a need to handle samples in different ways. Our instruments take the hard work out of sample prep and loading procedures. The vibrating sample holder makes loading samples easy. It is recommended for non-energetic material, that can be powdered to < 150 μm .

The sample spinner is recommended when a sample cannot be powdered (e.g., explosive material), a sample < 10 mg, liquids, or moist materials (Figure 1). The sample spinner cells are easy to assemble and can be stored away for analysis at a later date.

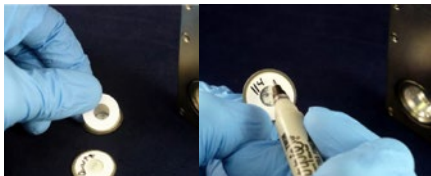


Figure 1. Olympus spinner cells can be easily assembled and labeled for archiving. Loading samples within the sample spinner is straightforward.

Explosives

Olympus pXRD instruments:

- Provide rapid identification of explosives and precursor material
- Identify and quantify impure and diluted explosives and precursor material
- Analyze organic and inorganic crystalline material, irrespective of reflectance or bonding-types
- Do not require a heating source to analyze the sample
- Can safely analyze energetic samples using the sample spinner (Figure 1)

Narcotics

Olympus pXRD instruments:

- Deliver rapid identification and quantification of controlled substances and precursor chemicals on-site
- Identify and quantify impure and diluted controlled substances and precursor material
- Can analyze moist or wet samples

Most illicit drugs are mixed with filler material or masking agents. Many on-site and laboratory analyzers (e.g., infrared, Raman) cannot identify these impure substances. With Olympus XRD, illicit substances can be identified and quantified (Figure 2).

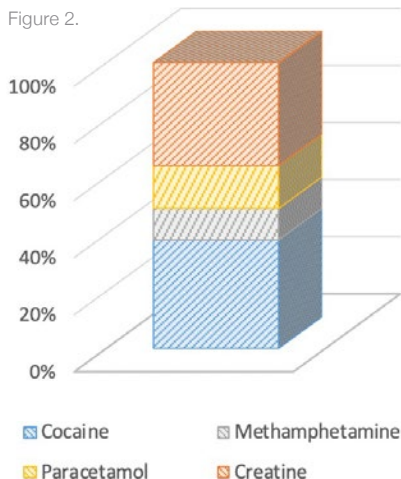


Figure 2. Controlled substance analyzed with Olympus XRD. The sample contains a considerable amount of gypsum (filler material), as well as illicit drugs, cocaine, and methamphetamine. Infrared spectroscopy was unable to recognize this impure drug as cocaine or methamphetamine. With Olympus XRD, the illicit drugs were identified and quantified to help the investigations.



Customs

Before cargo leaves or enters a country, it is important to know the composition of the goods. As our instruments do not require technical expertise to load or unload a sample, the samples can be easily analyzed on-site with the data emailed to a customs official for further analysis.

Olympus pXRD instruments:

- Verify the composition of goods being imported or exported
- Analyze unknown samples on-site
- Provide fast, easy sample preparation

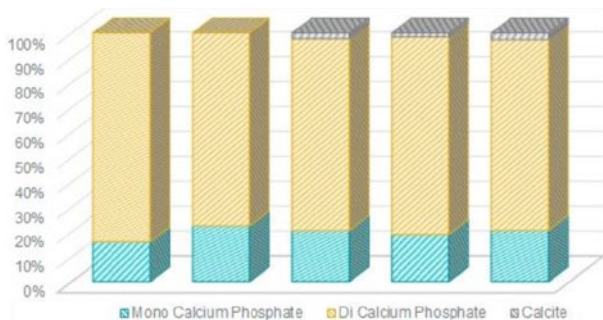


Figure 3. Monocalcium phosphate: \$1.04, dicalcium phosphate: \$1.95. With many tons imported daily, XRD analysis is important to avoid a large discrepancy between customs and duty fees.

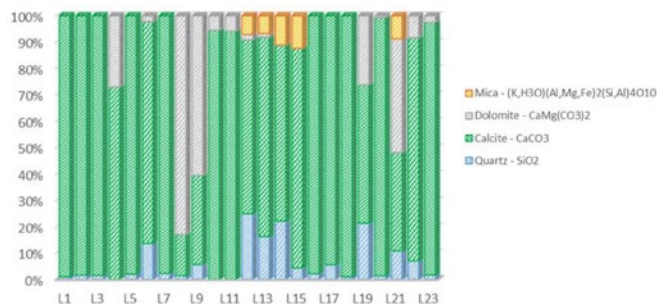


Figure 4. Soil mineral profiles from the site and shoes enable forensics officers to identify suspects on the scene.

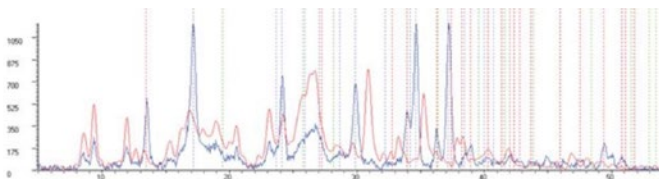
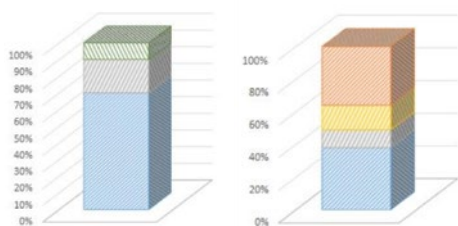


Figure 5. Measuring narcotics with low purity, as it is mixed on the street. This is only possible with portable XRD as other techniques cannot identify narcotics at lower concentrations in the field.