# Datasheet

## Handheld Hyperspectral Imager (400-1000nm) ATH2000

## Features

- Maximum Wavelength Range: 400–1000nm
- Best Spectral Resolution: 1.5nm
- Maximum Spatial Channels: 1200
- Imaging Mode: Built-in Scanning
- Operating System: Android
- inch HD Capacitive Touchscreen
- 13MP Visible Light Viewfinder Camera
- Red Indicator Laser
- Data Format Compatible with ENVI

## Applications

- Geology & Mineral Resource Survey
- Precision Agriculture, Crop Growth & Yield Assessment
- Forest Pest & Disease Monitoring, Fire Prevention
- Coastline & Marine Environmental Monitoring
- Grassland Productivity & Monitoring
- Lake & Watershed Environmental Monitoring
- Agricultural & Livestock Product Quality Testing
- Military, Defense & Homeland Security
- Disaster Prevention & Mitigation

## Description

Optosky ATH2000 is a newly designed and optimized handheld VIS-NIR Hyperspectral Imaging System with groundbreaking features, operating in the wavelength range of 400–1000nm. It boasts an attractive design, compact size, and light weight, making it easy to hold with one hand, portable, and user-friendly.

Equipped with an Android operating system and a high-definition touchscreen, the ATH2000 offers large internal storage, ensuring ease of use. In addition to its small size and light weight, the ATH2000 provides high spatial resolution, high spectral resolution, and a wide imaging range. The system consists of two main components: the imaging lens and the hyperspectral imaging camera.

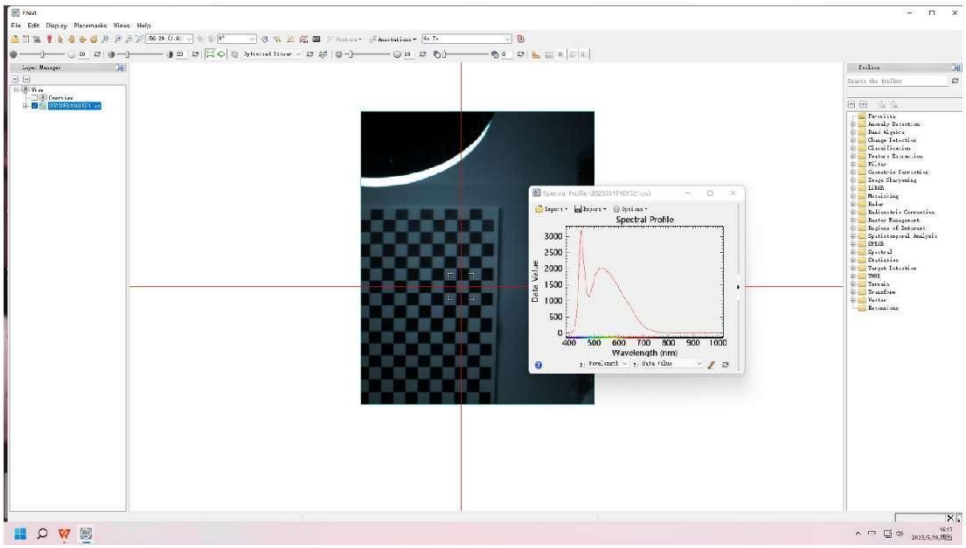
The ATH2000 uses a high-performance 1920×1200 pixel CCD imaging sensor, delivering clear images with low noise and good linearity.

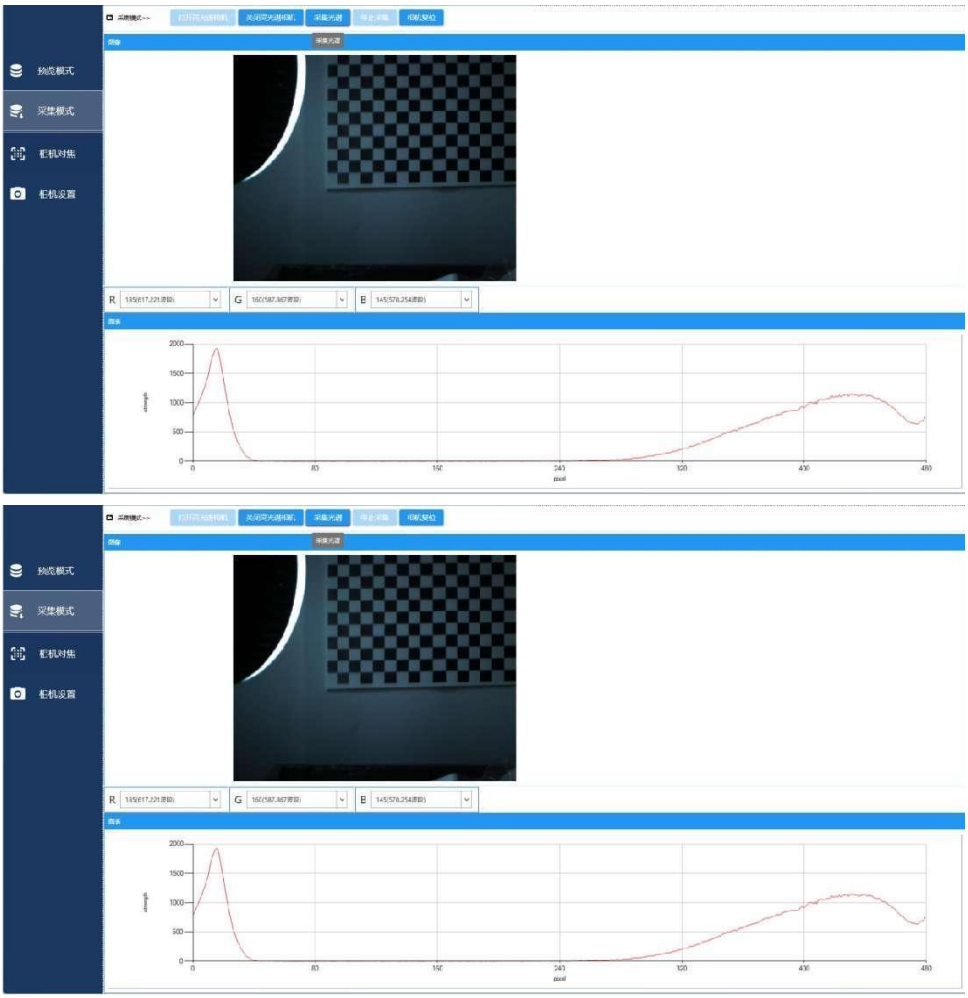
Thanks to its thermally stable optical system, the ATH2000 offers excellent stability and sensitivity for VIS-NIR applications. It meets the stringent requirements of laboratory, field, and industrial applications, making it a powerful tool for sectors such as agriculture, forestry, meteorology, and remote sensing (RS).

# 1. Parameter

| Performance | Parameter |
|---|---|
| Product Model | ATH2000 |
| Spectral Range | 400 ~ 1000nm |
| Best Spectral Resolution | Better than 1.5nm |
| Detector | High-sensitivity VIS-NIR detector |
| Original Detector Channels | 1920×1200 |
| Pixel Bit Depth | 12bit |
| Max Frame Rate | 156fps |
| Imaging Mode | Built-in Scanning |
| Visible Light Viewfinder Camera | 13MP |
| Indicator Laser | 650nm Red Laser, 5mW (Class IIIB) |
| Operating System | Android 12.0 |
| Touchscreen | 6-inch capacitive |
| Physical Interface | USB, Tripod |
| Waterproof Rating | IP54 |
| Battery Life | 4 hours, replaceable battery |
| FOV | 11.46°@f=35mm, depends on lens |
| IFOV | 0.7mrad@f=35mm, depends on lens |
| Dimensions (excluding lens) | 230×130×110mm |
| Weight | 1.3Kg |
| Operating Temperature | -20 ~ 50°C |

# 2. Image Examples






# 3. Effect Diagram


# 4. Hyperspectral Applications

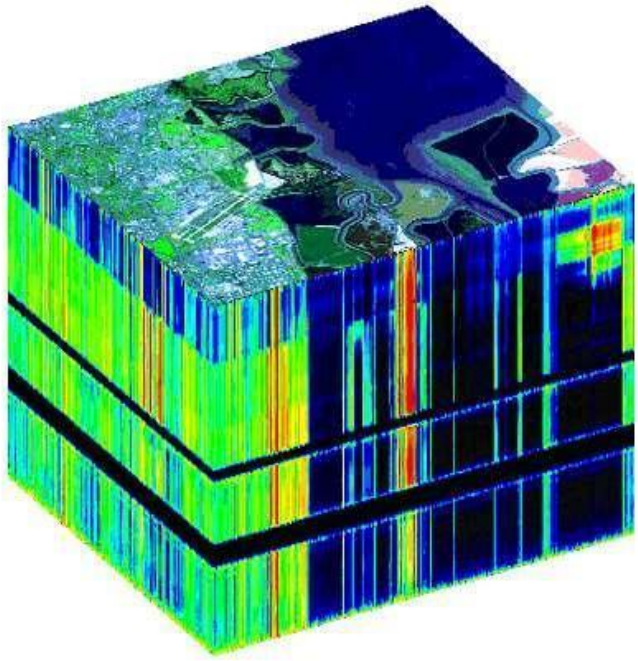


Figure 1: Data Cube Captured by the Hyperspectral Imager

## 4.1. Application of Hyperspectral Imaging in Industrial Sorting

With the development of near-infrared hyperspectral technology, JIANG and others have attempted to use near-infrared hyperspectral technology to detect impurities in cotton, especially the application of short-wave near-infrared hyperspectral technology, which has significantly improved the detection rate of plastic films compared to conventional methods. Hyperspectral imaging technology is based on imaging data from many narrow spectral bands, which allows for the acquisition of both image and spectral information of the sample while imaging. Common hyperspectral data processing methods include Partial Least Squares (PLS), Support Vector Machine (SVM), and Artificial Neural Network (ANN).

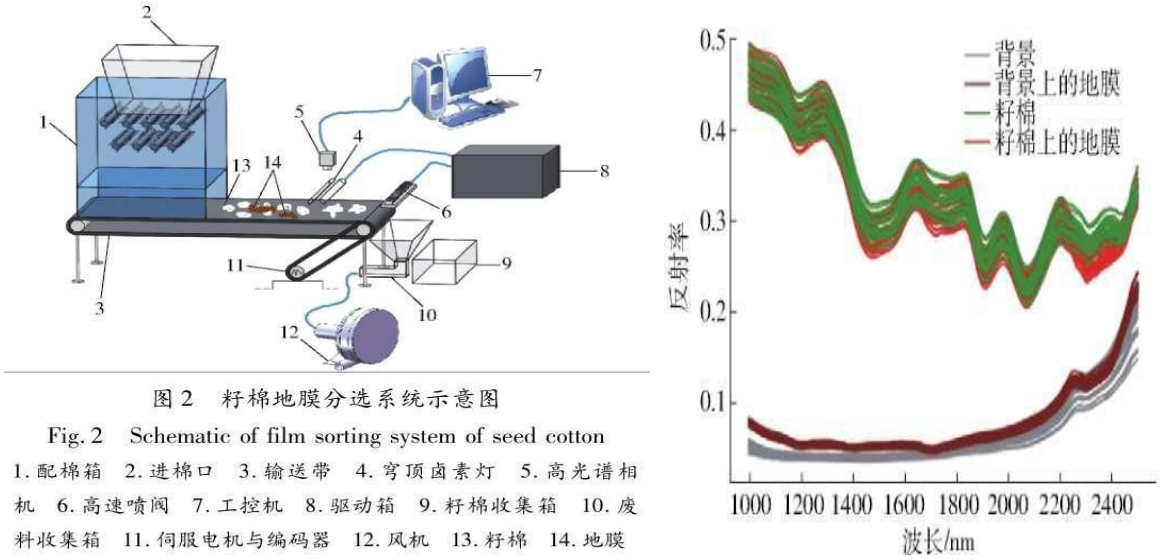



图 2　籽棉地膜分选系统示意图

Fig. 2　Schematic of film sorting system of seed cotton

1. 配棉箱　2. 进棉口　3. 输送带　4. 穹顶卤素灯　5. 高光谱相机　6. 高速喷阀　7. 工控机　8. 驱动箱　9. 籽棉收集箱　10. 废料收集箱　11. 伺服电机与编码器　12. 风机　13. 籽棉　14. 地膜

Figure 2: Application of Hyperspectral Imager in Cottonseed Sorting;
（a）System Function Composition;
（b）Reflectance Spectra Curves of Different Substances

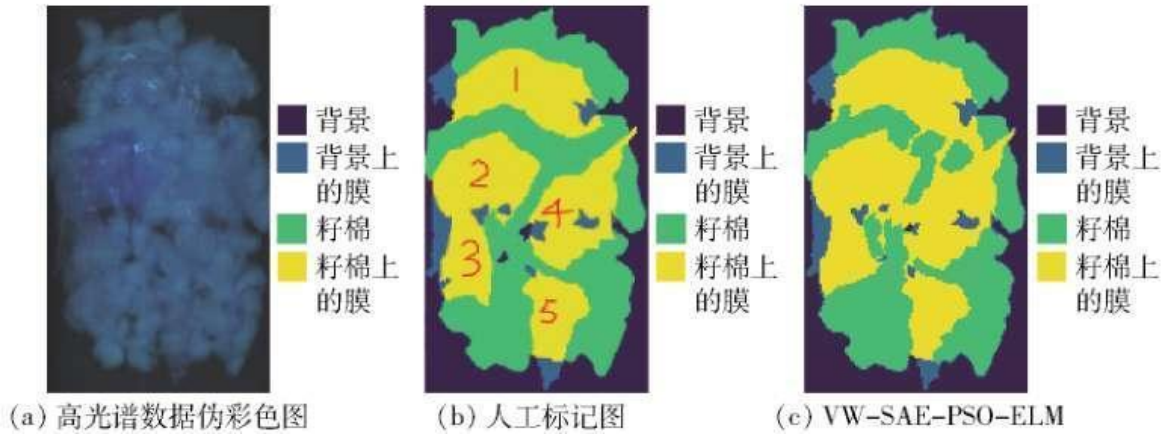



Figure 3: Application of Hyperspectral Imager in Cottonseed Sorting;
(a) Manual Labeling; (b) Hyperspectral Imager Recognition Results

The external quality of apples is the most intuitive characteristic that directly affects both their price and consumer preferences. In response to the challenges and key points in external apple inspection, a detection method for the external physical quality (shape and size) and common surface defects of apples has been studied based on machine vision technology, hyperspectral imaging technology, and multispectral imaging technology. This research combines image processing techniques, pattern recognition methods, chemometric methods, and spectral analysis technology. The detection system and algorithms developed based on the above research lay the foundation for the rapid online detection and grading equipment of apple external quality, using machine vision technology and multispectral machine vision technology in China.

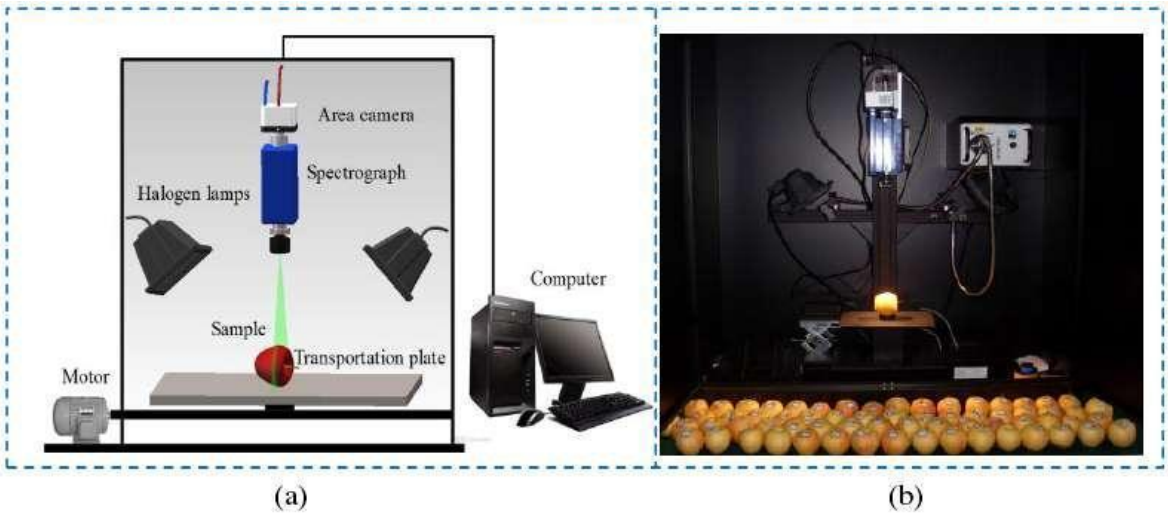



Figure 4 shows the schematic and physical diagram of the hyperspectral imaging system developed by Dr. Zhang Baohua from Shanghai Jiao Tong University; (a) Schematic diagram; (b) Physical diagram.

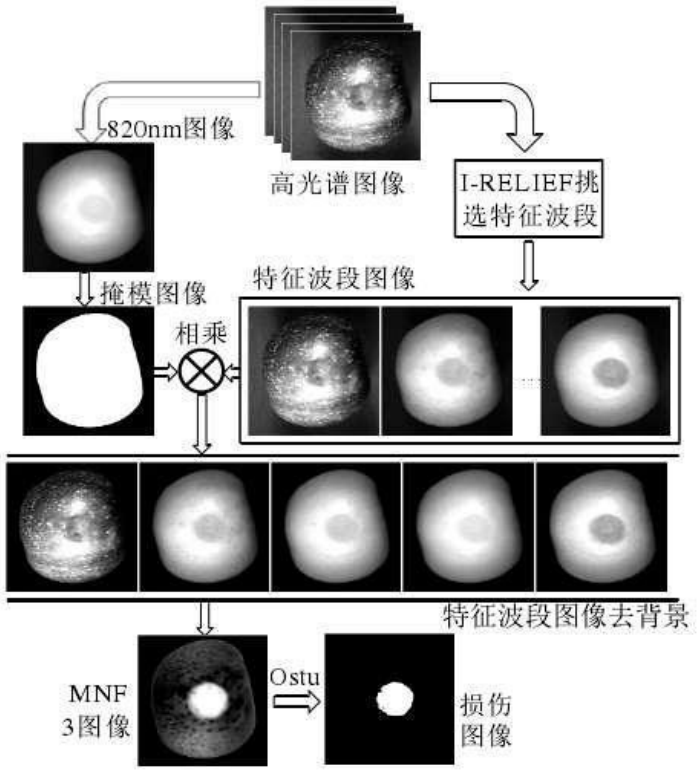


Figure 5 shows the flowchart of the early damage detection algorithm for apple surfaces.

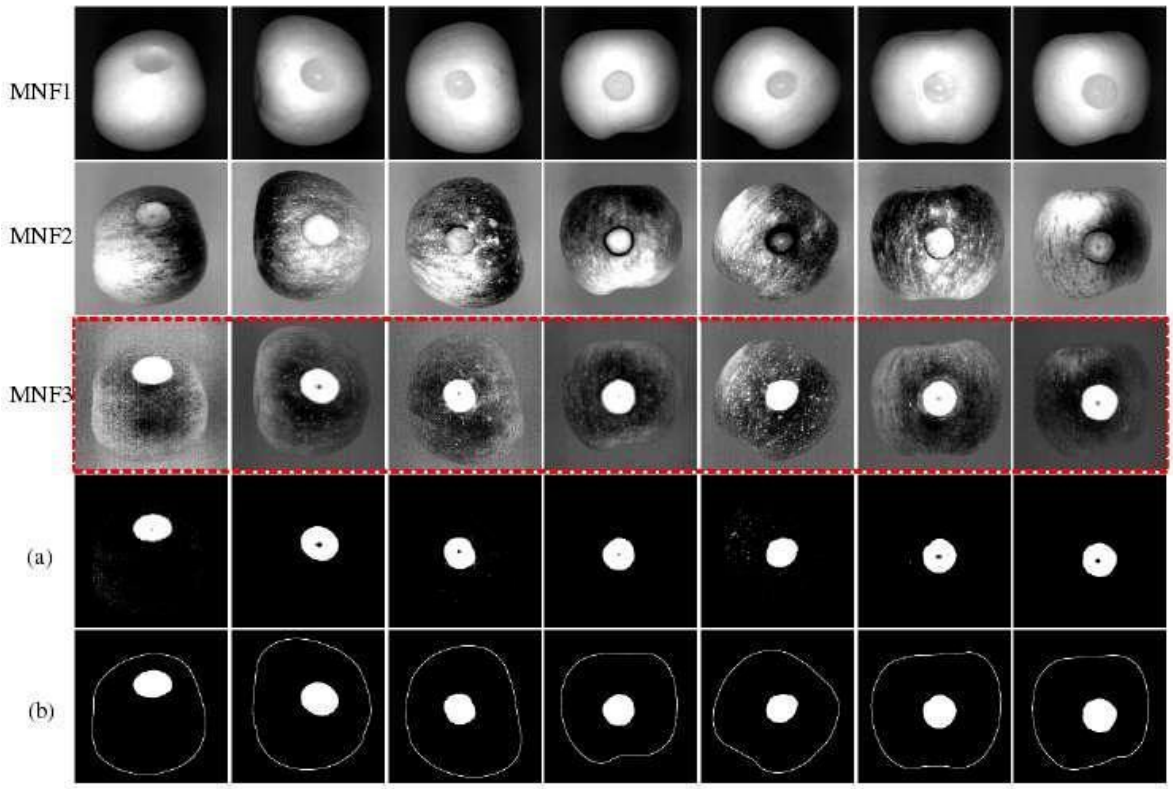



Figure 6 shows the identification results and intermediate processing steps for early apple rot:
(a) Rot segmentation result
(b) Final result

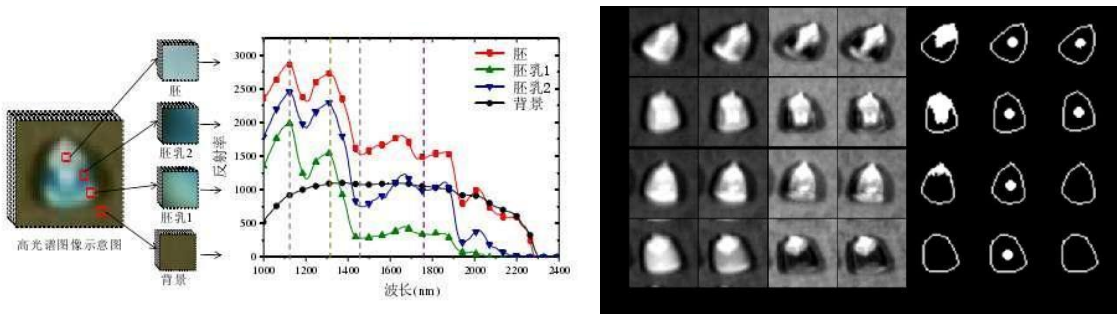



Figure 7 shows the application of a 1000-2500 nm hyperspectral imaging system in corn seed sorting (Dr. Wang Chaopeng from Northwest A&F University).

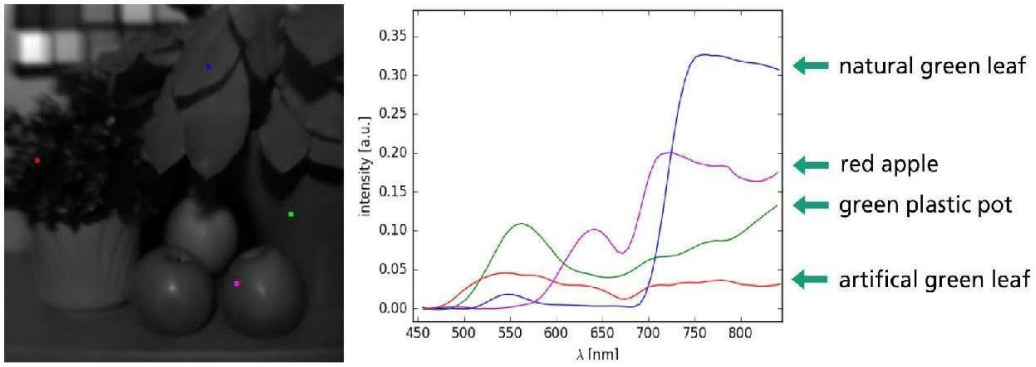


Figure 8 shows the spectral graphs of natural green plants, artificial green leaves, green plastic, and red apples.

## 4.2. Applications of Hyperspectral Imaging in Public Safety

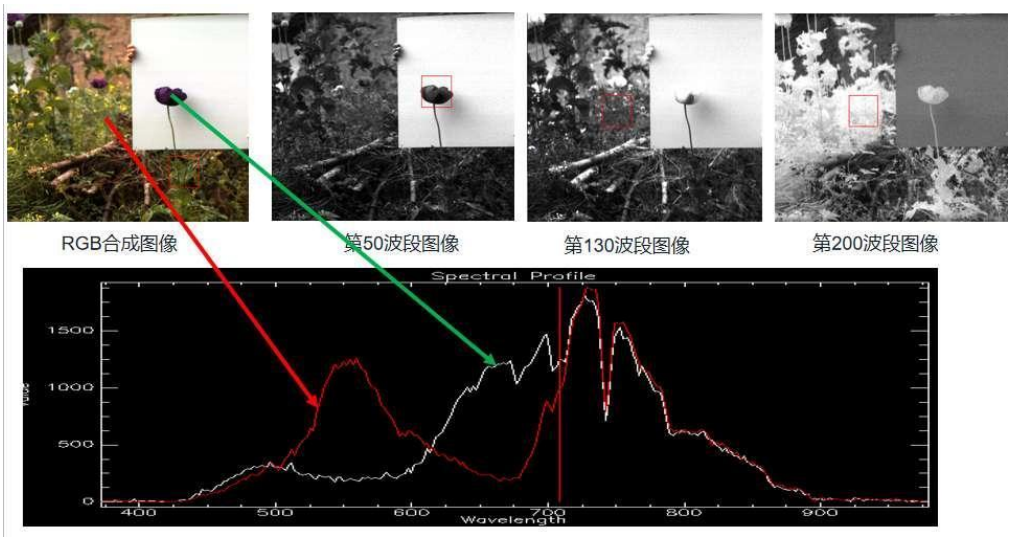



Figure 9 shows the application of hyperspectral imaging in searching for illegal poppy cultivation.

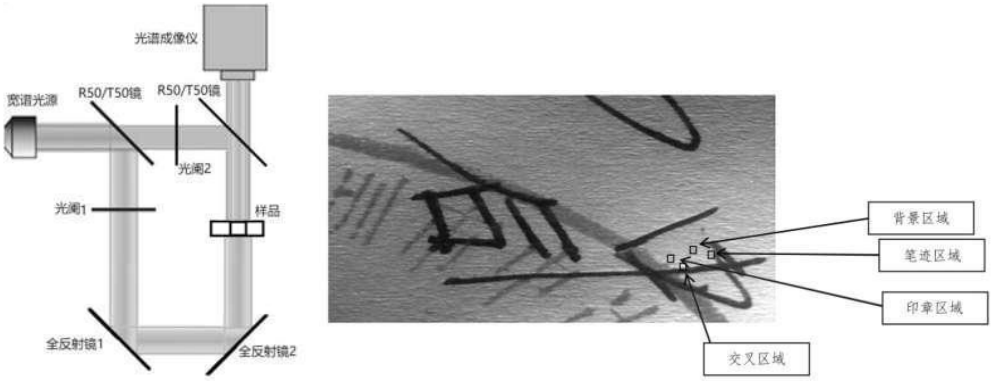



Figure 10 shows the application of hyperspectral imaging in document inspection.