



## Hyperspectral Imaging for R&D and Process



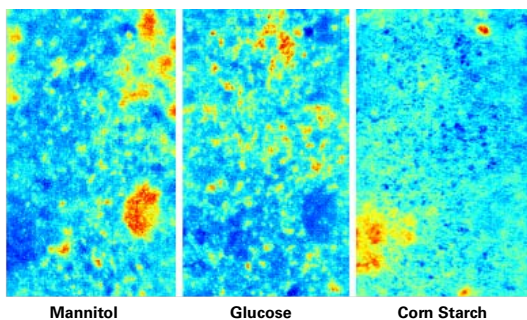
### Chemical Imaging

For many near-infrared spectroscopy applications, hyperspectral imaging can extend sample measurement to an entire surface area. Each point on the sample surface has its individual spectrum measured and can be interpreted to determine chemical identity or chemical composition. The visual representation of such information is called chemical imaging. The samples can be small or large, stationary, or moving with a constant speed on a conveyor or other transport system.

### Hyperspectral System Integration

Optimal use of hyperspectral cameras requires effective choice and configuration of illumination, imaging optics, filters and data processing software. Middleton Research works closely with every customer to design an integrated hyperspectral system that meets the unique demands of each application. Our applications laboratory also tests customer samples and performs feasibility studies using both hyperspectral and conventional spectroscopic equipment.

Individual Component Prediction of Same Blend



### Process Monitoring

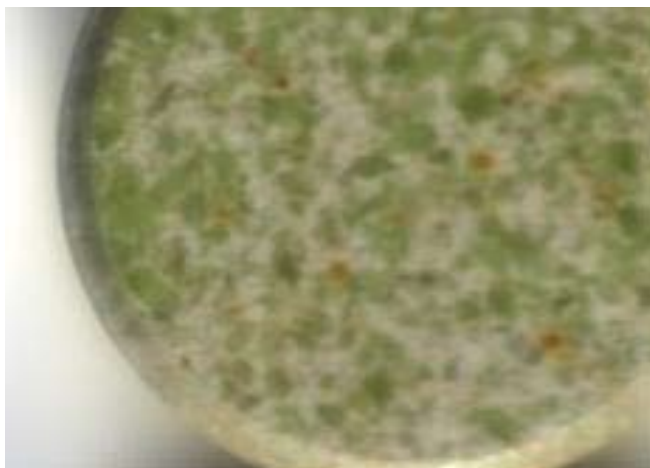
Complete on-line hyperspectral installations include the need for fast prediction software to match the high-speed camera output. The resulting data is transformed into a format that interfaces with the customer's process control computer for on-line monitoring and process adjustment. Middleton Research works with each customer to create a complete system to match the data analysis and process interface needs for each application.





## Hyperspectral Imaging Applications

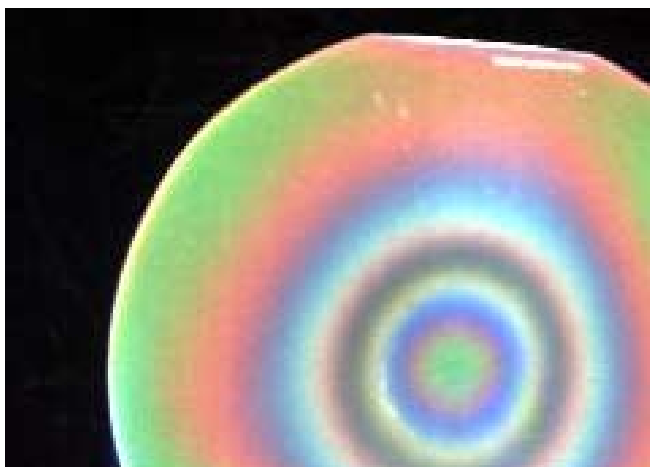
Chemical imaging applications extend to many industrial processes, including pharmaceutical, agricultural, life sciences, forensics and food production.



**PHARMACEUTICAL** applications confirm composition and produce a better understanding of the distribution of active pharmaceutical ingredients and excipients, not only in the test laboratory, but also in the real-time manufacturing process.



Chemical imaging is a powerful tool to measure and identify inorganic materials. **DRILL CORE** samples can be analyzed easily using a hyperspectral camera system that covers the entire surface, establishing composition as a function of drill depth.



Detectors, photovoltaic devices and a broad range of **SEMICONDUCTOR** products are made with evaporated or chemically deposited films. Hyperspectral imaging is an ideal technology to measure the distribution of film thickness over the entire area of a wafer or device.



Important process parameters in **FOOD** products include spatial distribution and quantity of proteins, fats and moisture. In this chocolate chip cookie, the chocolate content is easily differentiated using the sharp 1436 nm band of chocolate.

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