Application Note

**Process Manufacturing**
Hyperspectral Imaging

Implementation of in-line hyperspectral sensing for the monitoring of critical formulation and inspection processes represents a valuable analytical technique for capturing important spectral data critical to the maintenance and operation of key steps within a process manufacturing operation.

Within the field of view of the sensor, hyperspectral imaging simultaneously yields precise information for all wavelengths across the complete spectral range available. Traditionally, the near infrared range (NIR) of 900 to 1700 nanometers and the extended visible-near infrared (Extended VNIR) range of 600 to 1600 nanometers are of considerable interest for process manufacturing applications.

With a wide field of view and optimized spectral and spatial resolution, Headwall's Hyperspec™ sensors are customized for in-line and at-line material inspection and quality control. .With the creation of the hyperspectral datacube, a data set that includes all of the spatial and spectral information, manufacturers are able to control and monitor critical process steps through the ability to:

- Generate wavelength-specific criteria for pass/fail processing for high speed inspection applications
- Derive the spectral signature for every point within the field of view for material classification
- Color render the image within the field of view based on an established library of spectral signatures

Two modes of operation are available for deployment of the Hyperspec™ sensor – a lens-based input system for capturing spectral images moving along or across the manufacturing line or with a fiber-based input for use as a multi-point, multi-channel spectrometer system.

**Food Processing**

**LCD Quality Control**

**Semiconductor Operations**

**Pharmaceuticals**

**Photovoltaics**

**Wafer Inspection**

Headwall's award-winning Hyperspec™ imaging spectrometer family is built on a totally reflective concentric, f/2.0 optical design and optimized for imaging in harsh environments. All Hyperspec™ instruments are based on Headwall's patented aberration-corrected, imaging design which feature the company's "original", high efficiency holographic gratings or diamond-turned diffraction gratings. To achieve very low stray light and high signal-to-noise performance, no prism or transmissive optics are used within the spectrometer. With Headwall's unique ability to design and fabricate the diffractive optics, each fully integrated Hyperspec™ imaging sensor is manufactured with application-specific, spectral and spatial imaging performance.

## Headwall Photonics offers the broadest range of spectral imaging instrumentation for demanding applications.

| Hyperspectral Sensors | Spectral Range |
|---|---|
| Hyperspec® VIS | 380 - 825 nm |
| Hyperspec® VNIR | 400 - 1000 nm |
| Hyperspec® Extended VNIR | 600 - 1600 nm |
| Hyperspec® NIR | 900 - 1700 nm |
| Hyperspec® SWIR | 1000 - 2500 nm |
| | |
| Micro-Hyperspec™ VNIR | 400 - 1000 nm |
| Micro-Hyperspec™ NIR | 900 - 1700 nm |
| | |
| High Efficiency Hyperspec® NIR | 900 - 1700 nm |
| High Efficiency Hyperspec® SWIR | 1000 - 2500 nm |

*Information on UV, MWIR, and LWIR Hyperspec® sensors are available upon request.*

## Raman Imaging Instruments

Raman Explorer™ 260 nm
Raman Explorer™ 532 nm
Raman Explorer™ 785nm
Raman Explorer™ 830 nm
Raman Explorer™ 1064 nm

Raman Discovery™ 532 nm
Raman Discovery™ 785 nm

### About Headwall Photonics:

Headwall Photonics is the leading designer and manufacturer of imaging spectrometers and spectral instrumentation for industrial, commercial, and government markets. Headwall's high performance spectrometers, spectral engines, and holographic diffraction gratings have been selected by OEM and end-user customers around the world for use in critical application environments. As a pioneer in the development of innovative spectrographs and imaging spectrometers based on optical technologies, Headwall enjoys a market leadership position through the design and manufacture of patented spectral instrumentation that is customized for application-specific performance. Headwall Photonics was formed in 2003 as the result of a management buy-out from Agilent Technologies. **For more information please call 978.353.4100 or email us at Information@HeadwallPhotonics.com.**

**Headwall Photonics • 601 River Street • Fitchburg, MA 01420 • 978.353.4100 tel • www.HeadwallPhotonics.com**