

Hyperspectral imaging expedites not only the drug discovery process, but also holds clear and distinct advantages for pharmaceutical makers as they move novel compounds and drugs from laboratory to manufacturing.

One clear advantage of Hyperspec[®] imaging is the ability to simultaneously scan multiple batches of tablets as they move across a process line. The technology is well-suited for conveyORIZED environments governed by the FDA's Process Analytical Technology (PAT) initiative.

Raman imaging, a related analytical spectral technique, has also proven to be an invaluable research tool for the drug discovery process. Different from hyperspectral imaging in that the sample is non-destructively excited with a laser, the results of Raman analysis yield spectral information highly specific and identifiable to known substances. Both of these imaging techniques demand exceptional spectral and spatial resolution.

Key advantages of hyperspectral imaging for pharmaceutical manufacturers include:

- 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
- For high-throughput screening and high volume manufacturing, generate wavelength-specific criteria for high speed quality control over the production process and pharmaceutical manufacturing line.

Hyperspectral datacubes represent a data set that includes all of the spatial and spectral information within the field of view. This valuable information enables researchers to more thoroughly evaluate the distribution of polymorphs throughout the samples and greatly enhance process knowledge relating to the spectral composition of these tablet compounds.



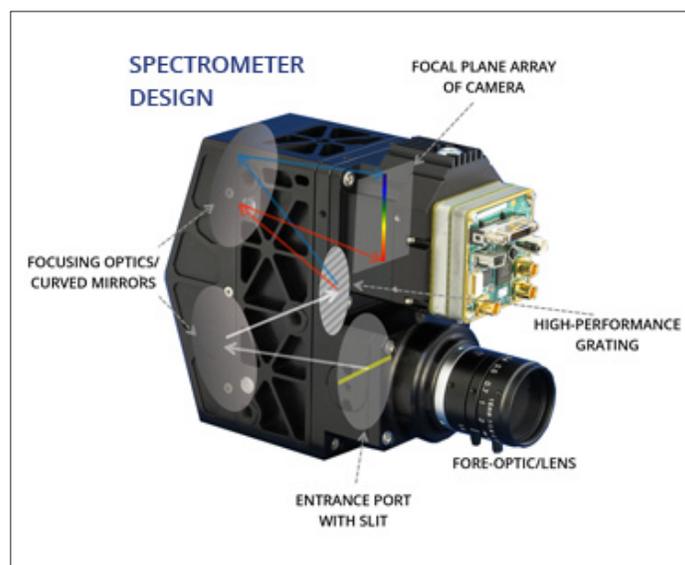
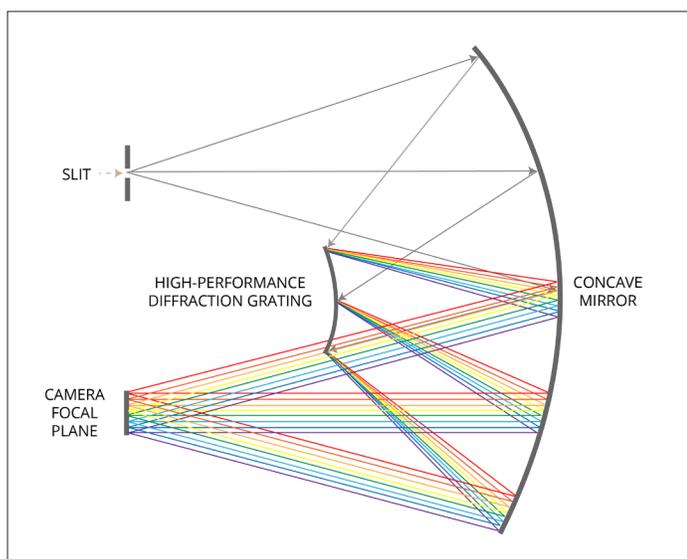
- Blending Quality Control
- Drug Discovery
- Manufacturing to Volume
- Polymorph Analysis
- Spray Dry Dispersion

Headwall is the world's leading manufacturer of hyperspectral imagers (Hyperspec®) for a wide range of industries including remote sensing, advanced machine vision, precision agriculture, and others. The Company also manufactures OEM spectrographs and spectral engines that are exceptionally precise with respect to high spectral and spatial resolution and signal throughput.

The core technology fundamental to these products is the holographic diffraction grating, which Headwall manufactures to exacting dimensions and tolerances and to customer specification. This allows for small and rugged

optical imaging instruments that deliver aberration-corrected performance and a very wide field-of-view. Used in Headwall's *concentric-style* imagers along with mirrors, the designs are simple yet elegant and feature no moving parts.

In addition to hyperspectral, Headwall also manufactures Raman imaging instruments that are available in a wide range of laser excitation wavelengths. Raman Explorer and Raman Discovery are very well suited for chemical imaging applications as well as biotechnology and medical applications.



About Headwall Photonics: Headwall 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 advanced, patented optics technology, Headwall enjoys a market-leading position through the design and manufacture of spectral instrumentation that is customized for application-specific performance.

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