

# SPECTRAL EVOLUTION

## Light Rare Earths (LREEs)

There are 17 rare earth elements in the periodic table and they are considered rare because they are not usually found in commercially viable concentrations. The elements are divided into light (LREE) and heavy (HREE) rare earths. LREEs include:

- ◆ Lanthanum
- ◆ Cerium
- ◆ Praseodymium
- ◆ Neodymium
- ◆ Samarium

LREEs are important to the high tech and energy industries in applications that include permanent magnets in everything from cell phones and iPods to generators and wind turbines; rechargeable batteries for electronic devices, power tools, and car batteries; catalytic converters for cars; fluid cracking catalysts; polishing powders; and glass additives. The major source for LREEs currently is China and exploration for new sources is ongoing worldwide. There are pathfinder minerals for many LREEs, including:

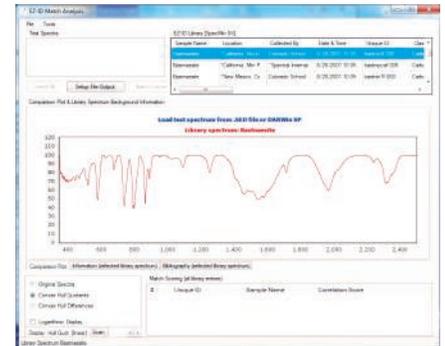
- ◆ Allanite
- ◆ Apatite
- ◆ Bastnaesite
- ◆ Cerite
- ◆ Monazite

Using a field spectrometer, like the SPECTRAL EVOLUTION oreXpress, oreXpert or oreXplorer, these pathfinder minerals can be identified. *In situ* reflectance spectra of ore rocks are used to quickly categorize them for the potential presence of LREEs based on analysis of spectra primarily with absorption areas of interest in the 350-1000nm range.

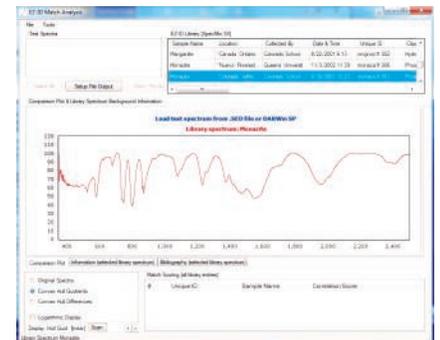
An oreXpress, oreXplorer or oreXpert with EZ-ID mineral identification software can quickly and accurately identify pathfinder minerals for LREEs by comparing target scans against the SpecMIN, USGS and GeoSPEC mineral spectral libraries which include known samples for the minerals listed above. The oreXpress is designed for field work. It's lightweight, sturdy, and reliable. It provides the highest resolution and sensitivity available in a field unit and is equipped with a comfortable handheld mineral contact probe and is available with a benchtop probe with a sample compactor.

EZ-ID allows you too select specific features within your scan for in-depth comparison and analysis. All spectra and associated data are saved in ASCII file format for use with popular 3rd party software packages, such as TSG. With EZ-ID pattern matching occurs seconds after scanning. The results can be used for mineral mapping in LREE exploration prior to drilling. ROI can be achieved quickly, simply by eliminating unnecessary and unprofitable drilling costs.

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***EZ-ID provides mineral identification capabilities. Here, a sample of bastnaesite from the SpecMIN library is available for matching against a target scan.***



***This EZ-ID display shows a SpecMIN library sample of monazite.***



***oreXpress in the field.***

26 Parkridge Road ♦ Suite 104  
Haverhill, MA 01835 USA  
Tel: 978 687-1833 ♦ Fax: 978 945-0372  
Email: [sales@spectralevolution.com](mailto:sales@spectralevolution.com)  
[www.spectralevolution.com](http://www.spectralevolution.com)

