Geologists study the Earth in order to understand its processes and to extract valuable resources. X-ray diffraction (XRD) analysis provides a multitude of information about crystalline phases within rocks, which is essential to understanding their mineralogy, chemistry, and formation conditions. XRD data provides direct information about the identity of crystalline phases, their relative abundances, crystallite size, strain, and site chemistry.

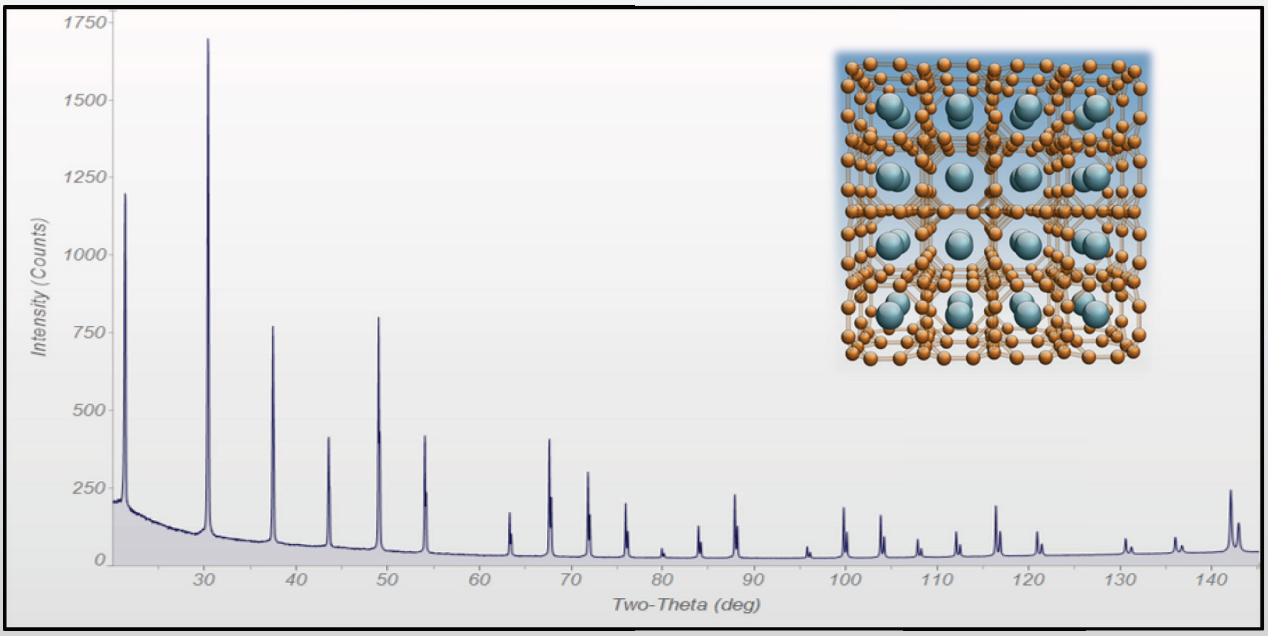
Historically, the mineralogy of rocks was evaluated via polarized light microscopy (PLM) of thin sections or back-calculated from chemical data. The error in these methods is much larger than that of XRD; and preparation of samples for XRD is much simpler and less time-consuming than for optical methods. XRD data can be used to distinguish between polymorphs and accurately identify the distribution of cations within the minerals making it the preferred method of geoscientists.

Common Applications of XRD in Geology:

- Determining extractability of metals from ore-bearing deposits
- Evaluating purity of pharmaceutical-grade limestone, used in antacid products
- Analyzing core samples taken for reservoir characterization
- Speciation and concentration of clay minerals within drilling mud for indirect monitoring of physical properties
- Identifying garnet type in kimberlites as an indicator for diamond concentration and quality
- Quantifying dolomitization for iron and zinc ore potential

- Determining metamorphic grade of rock
- Implementing spiking methods to determine concentration of non-crystalline phases
- Computing hydration states of clay and salt minerals

Scan of Lanthanum Hexaboride (LaB_6)



Low Angle Scan of Silver(I) Behenate Nanocrystals