Equipment in Mineral Sciences NHMLA

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# Mineral Sciences Laboratory

The Mineral Sciences Laboratory is on public display as of November 2017.  All experimental stations, collections, and equipment are on view and scientific content is communicated to the visitor by signage, gallery interpreter engagement, video, and social media to our more than 800,000 physical visitors a year.  The Natural History Museum of Los Angeles County is located at 900 Exposition Blvd., Los Angeles. It is open daily 9:30 a .m. to 5 p .m. The Museum was the first dedicated museum building in Los Angeles, opening its doors in 1913. It has amassed one of the world’s most extensive and valuable collections of natural and cultural history — with more than 35 million objects, some as old as 4.5 billion years. The Natural History Family of Museums includes NHMLA, the La Brea Tar Pits and Museum (Hancock Park/Mid - Wilshire), and the William S. Hart Park and Museum (Newhall, California). The Family of Museums serves more than 1 million families and visitors annually and is a national leader in research, exhibitions, and education.

## Raman Microscopy

The Mineral Sciences Department is outfitted with a Horiba ExploRa+ dispersive Raman microscope.  Two lasers can be selected, a 532 nm and a 785 nm, with automated calibration for each laser using a silicon standard.  Typical Raman spectra for the 532 nm laser can be collected from 70 cm-1 to > 5000 cm-1, while the 785 nm laser spectral range is nominally from 80 cm-1 through 2500 cm-1.  Beam size at the sample is approximately 1.2 μm. Slits can be used to obtain better spectral resolution from a selection of 50 μm, 100 μm, 200 μm, and the microscopic can be used in confocal mode by selecting a pinhole, 100 μm, 200 μm, and 500 μm.  Laser power at the sample is adjustable, with a maximum of 15.2 mW (532 nm) at the sample.  Diffraction grating options are 600 gr/mm, 1200 gr/mm, 1800 gr/mm, and 2400 gr/mm, where the 1800 gr/mm is most commonly used.  A 10x (0.1 N.A.), 100x (0.9 N.A.), and 100x (0.7 N.A) long working distance objectives are available.  An automated XYZ stage controls sample positioning and mapping procedures.

## X-ray Fluorescence Microscope

The micro-XRF analyzer (Horiba XGT-7200) is used for single point, multi-point (user selected or line-scan), hyperspectral mapping analysis, and transmitted X-ray imaging.  The spatial resolution of the instrument is adjustable by means of computer-controlled switching between the 50 μm and 1.2 mm X-ray mono-capillary guide tube.  Dual vacuum modes (full and partial) allow for solid and liquid analysis.  Partial vacuum analysis keeps the sample at room pressure and the vacuum is applied to the detector and X-ray optics.  The elemental range is from Na to U, and Rh target is used with a maximum tube power at 50 kV and 1 mA.

## X-ray Diffraction

### Single Crystal

The Rigaku R-Axis II is used to determine the atomic structure of crystals.  Crystals typically need to be less than 300 microns on edge, and larger than 5 microns on edge.  The R-Axis II also can do powder diffraction of single crystals or aggregates of crystals that would normally be too small for dedicated powder diffraction instruments.

### Powder

The Proto AXRD is a low power (600W, copper) X-ray powder diffractometer with a 6-sample autochanger.  The autochanger rotates the sample during data collection to help increase powder averaging statistics.  The AXRD is equipped with a Dectris Mythen linear detector.  Data from this instrument are used for mineral phase analysis as well as Rietveld refinement in some cases.

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