

## EDS Analysis at Boston College

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Scanning Electron Microscope – Energy Dispersive Spectroscopy (SEM-EDS) provides elemental chemistry on extremely small samples. SEM-EDS instruments are quite expensive – mid six to low seven figures. Tom Mortimer and Peter Cristofono have qualified to operate the Boston College SEM – EDS instrument. The MMNE qualifies for the very reasonable non-profit rate. Two articles describing EDS sample grain preparation and solicitation samples for analysis from MMNE members have appeared in the club newsletter. Additionally, in the fall of 2014, the MMNE sponsored an EDS analysis session at Microvision in Chelmsford, MA.

Offers for sample analysis have been extended to members at MMNE business meetings. Through 2016, at least fifteen MMNE members have had samples analyzed as a result of these offers. Depending on the number of samples, EDS sessions may last two to four hours. With properly prepared samples, we can collect analytic data on 10 to 12 samples per hour. There is some “front-end” instrument preparation time, including loading liquid nitrogen, mounting the sample block on the transfer pedestal, loading the sample through the instrument port and initializing the two instrument work-stations. Prior to visiting the laboratory, a polished grain sample block is prepared. This can take four to six hours for a ten to twenty sample set. (Tom enjoys doing this!)

We believe this is an extraordinary service and opportunity for the MMNE; an opportunity available to few, if any, other mineral clubs in the country. (The Maine Mineral Museum has announced a mineral ID service with their lab for \$40. per sample. However, their result does come with the expertise of Al Falster.)

EDS analytic results to date have contributed to several articles in the MMNE newsletter. We strongly encourage members to publish results of their analyses in the newsletter. Members should take photos of specimens sent for analysis, so published results can show, as clearly as possible, the mineral species indicated by the analysis. We strongly encourage members to share analysis results on samples that may be useful to other members. This sharing may be via a newsletter article.

### Guidelines for EDS Grain Submission

For submission to EDS analysis, sample grain size should be 0.5 to 4 mm. Grain(s) should be affixed to an 3 x 5 index card with transparent tape. The card **MUST** contain the following information: (Samples will be rejected for incomplete data.)

- MMNE member name
- MMNE member email address. (Results will be emailed to members.)
- Grain sample locality source (Just the country of origin is insufficient!)
- Mineral grain source sample description (e.g. tan, glassy, extracted from feldspar matrix)
- Grain identifying reference number – assigned by submitting member (e.g. TM106). Emailed reports will reference these numbers. Members should mark their grain source specimens. It is most frustrating to get a result and not know from whence it came!

- (Optional) If you have a guess as to the possible identification, please indicate, particularly when heavy metals are suspected, as this affects the choice of EDS electron beam energy, and thus potentially the validity of the result.

Additional considerations:

- The sample grain **MUST** be homogeneous. Grains that appear to contain multiple minerals will be rejected.
- **ONLY** grain samples may be analyzed. We cannot accept crystals on matrix.
- Thin surface crusts will not be analyzed. These will likely be ground off in the preparation process.
- Light elements Hydrogen, Lithium, Beryllium and Boron are not detectable by the instrument. (Measurement of carbon requires a calibration process that we are working on.)
- Grain samples will not be returned.
- Depending on the volume of submitted samples, the number of samples analyzed for a member in any given session may be limited.
- By submitting samples, members agree to have the submission species, locality, and EDS result included in the “members only” area of the MMNE web site.

Finally, in most cases, the EDS analysis does not provide a definitive identification, only an approximate proportional chemistry of the unknown. Members will have to investigate the species (plural!) suggested by the EDS chemistry to narrow the mineral identity to one of the suggested candidates. Mindat.org and webmineral.com provide very useful tools to assist in identifying minerals containing the EDS reported elements. An important output from the EDS analysis is what elements are **NOT** present. This knowledge often eliminates many candidate species from consideration. Observation of the physical properties (luster, hardness, crystallography, and associations) of the submitted mineral should guide the investigation. Knowledge of the source mineral environment (e.g. pegmatite, ore vein, skarn) is often an important contributor in a final determination.