## 'Slab' XRF: a quick and not-so-dirty method for estimating compositions of fine-grained rocks

**S.A. Hicks** (fssah1), **K.K. Jensen, R.J. Newberry,** Department of Geology & Geophysics, University of Alaska, Fairbanks, AK

Conventional XRF (X-ray fluorescence) analysis of rocks requires preparation of a glass disk or pressed pellet from pulverized rock, largely to homogenize the constituent elements. Our work, however, shows that smooth cut slabs from fine-grained rocks yield near-quantitative results for major elements and provisionally for minor elements. We employ an elderly Rigaku wavelength-dispersive XRF standardized with pressed pellets of natural rock standards. Counting times vary from 10 to 100 seconds per element; 5 samples can be run in a batch load that analyzes for 10 oxides ($Fe_2O_3$, MnO, $TiO_2$, CaO, $K_2O$, $P_2O_5$, $SiO_2$, $Al_2O_3$, MgO, and $Na_2O$) and takes 40 minutes to complete.

Ideally-sized specimens are cut flat with a conventional diamond-blade rock saw to between 3 and 5 cm diameters. Surfaces are polished briefly if there are significant surface irregularities from sawing; in most cases acceptable results are given by raw cut surfaces. Replicate slabs yield consistent results $\pm$ 5% of the amount present; smaller or composite samples yield low totals but relative abundances that (once normalized to 100%) are comparable to those for full-sized samples. Slabs with grain sizes up to 2 mm appear to yield satisfactory results if the minerals are homogeneously distributed; for coarser-grained rocks the results are highly dependent on sample positioning within the sample holder. For those fine-grained rocks of consistent, known composition we have tested (e.g., Browns Hill Quarrry basalt) 'slab xrf' results are very comparable to standard XRF. Our greatest difficulty lies with analysis of SiO2, as even small relative errors lead to significant absolute errors and because at high concentrations the concentration-response curve is distinctly non-linear. We employ two drift monitor standards—one appropriate for low- and moderate-$SiO_2$ and one for high- and very high-$SiO_2$ rocks—to cope with this problem.

We have thus far employed 'slab xrf' for two sorts of studies: categorization of fine-grained, low-grade metamorphic rocks from central Big Delta quadrangle and categorization of fine-grained rocks from the introductory geology collection. Examination of the fine-grained metamorphic rocks shows that nearly ½ of the field classifications were in error; in particular, rocks described as felsic or intermediate 'meta-tuff' invariably possess compositions indicative of sedimentary protoliths. In contrast, most rocks identified in the field as greenstone truly have basaltic major oxide compositions. Geology collection rocks and minerals have offered a few surprises, for example, 'Wards Albite' is an intermediate plagioclase; a sample of 'pitchstone (basalt)'is actually a rhyolite. 'Slab XRF' could be a useful tool for estimating degree of dolomitization in fine-grained carbonate rocks; for basic naming of fine-grained volcanic rocks; and for quartz vs clay determinations in mudstones.