Using pXRF to Assess Heterogeneous Sample Preparation Methods: Applications to Coarse-Grained Felsic Rocks

Monica M. Estrada, Scott S. Fenner, and Mark T. Ford

Department of Physics and Geosciences, Texas A&M University–Kingsville,
MSC 175, 700 University Blvd., Kingsville, Texas 78363

GCAGS Explore & Discover Article #00112*
http://www.gcags.org/exploreanddiscover/2016/00112_estrada_et_al.pdf
Posted September 13, 2016.

*Abstract published in the *GCAGS Transactions* (see footnote reference below) and delivered as a poster presentation at the 66th Annual GCAGS Convention and 63rd Annual GCSSEPM Meeting in Corpus Christi, Texas, September 18–20, 2016.

ABSTRACT

Understanding sample heterogeneity and how to process such samples to achieve representative geochemical analyses is of great importance. Heterogeneous samples can be found across the geosciences, from facies changes in reservoir rocks to igneous rocks like granite. Our investigation will focus on determining the representative bulk chemistry of the igneous 'Buckley' granite but methodologies and results should be applicable to a wide range of geologic materials. The portable x-ray fluorescence spectrometer (pXRF) is a relatively new technology that can analyze a sample's chemical composition. The device uses x-ray fluorescence, the energy given off when an electron in a higher shell cascades to fill a lower shell, and compares it to the known energy given off by specific elements giving the user an accurate chemical composition. The purpose of the current research project is finding the capability of this device to accurately measure chemical compositions in heterogeneous samples. By comparing pXRF analyses of the samples using multiple techniques and processing methods we will determine the suitability of these techniques for collecting geochemical data on heterogeneous samples. The information gathered can also determine the suitability of the pXRF as a handheld device in the field. For our study we are using two polished granite slabs (countertops) we received as a donation from John Buckley. These samples contain plagioclase feldspar, potassium feldspar, quartz, biotite, and magnetite. A more accurate mineralogy of our sample, including trace phases will be produced by examining standard thin sections. We will conduct a point count on both the polished surfaces of the slabs and thin sections to get a representation of the volumetric percent of the different phenocrysts. We will analyze five different sample preparation methods of the Buckley granite with the pXRF. Geochemical analyses will be collected by using the pXRF over grid patterns on both the polished and rough but flat sides of the slab as well as on broken pieces of the slab which would simulate the uneven surfaces produced in the field. A commercial laboratory will create a fine homogeneous powder and analyze it by using a standard bench-top XRF. We will also analyze this powder using our pXRF spectrometer. Once the data from all aspects of the research is acquired and the multiple processes compared, we will determine the suitability of the handheld pXRF for field use. Investors, pXRF research scientist, geochemists, and others will benefit from having other avenues

Originally published as: Estrada, M. M., S. S. Fenner, and M. T. Ford, 2016, Using pXRF to assess heterogeneous sample preparation methods: Applications to coarse-grained felsic rocks: Gulf Coast Association of Geological Societies Transactions, v. 66, p. 943.

of data collection. If our results adequately reproduce the results from the commercial laboratory, these methods would be a time and cost savings over traditional field sampling and processing of large quantities of rock. Additionally, this would permit study in areas where sample collection is unfeasible. Finally, our results will improve knowledge on how to process properly any type of heterogeneous sample.