
Petrology and Geochemistry of a Mitchell Dam Amphibolite Core, Chilton County, Alabama

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GCAGS Explore & Discover Article #00355*

http://www.gcags.org/exploreanddiscover/2018/00355_kirk_et_al.pdf

Posted September 29, 2018.

*Article based on a full paper published in the *GCAGS Transactions* (see footnote reference below), which is available as part of the entire 2018 *GCAGS Transactions* volume via the GCAGS Bookstore at the Bureau of Economic Geology (www.beg.utexas.edu) or as an individual document via AAPG Datapages, Inc. (www.datapages.com), and delivered as a poster presentation at the 68th Annual GCAGS Convention and 65th Annual GCSSEPM Meeting in Shreveport, Louisiana, September 30–October 2, 2018.

ABSTRACT

The Mitchell Dam Amphibolite is the southwesternmost of a series of amphibolite bodies in the Eastern Blue Ridge of central east Alabama. Several studies have produced various types of geochemical and geochronologic data for these amphibolites, but no systematic data on a continuous section has been available.

Two test cores taken in the area where Mitchell Dam was constructed yielded a section about 138 ft thick but with 21.5 ft missing between the two cores. The lower 98 ft consist of massive hornblende-plagioclase amphibolite displaying some textural variations. The upper 32 ft consist of a metasedimentary unit that commonly shows some cataclasis. Metamorphic mineral assemblages in the rocks are typical of amphibolite facies metamorphism. Quartz, biotite, plagioclase, clinozoisite, and garnet are the common minerals in the metasedimentary units; in addition, green hornblende is added to the assemblage in metagraywackes. Hornblende and plagioclase dominate the amphibolite.

In this study, 65 samples were taken at an average spacing of 1.7 ft (range from 0.5 to 7 ft) to build profiles to show chemical variation throughout the core and determine the protolith of the amphibolites. The amphibolite has bulk compositions characteristic of subalkaline basalts. The compositions follow a tholeiitic trend on an AFM diagram. Rare earth patterns are relatively flat, and high field strength elements are notably depleted, particularly zirconium. Whole rock and trace element geochemistry suggests a tholeiitic protolith formed over a subduction zone, most likely generated in the very early stages of subduction.