Oklahoma Geological Survey Guidebook 21, 1982

U/PB ZIRCON AGES FROM MOUNT SHERIDAN GABBRO WICHITA MOUNTAINS

Samuel A. Bowring
Wendel J. Hoppe

INTRODUCTION

In the last 10 years it has become apparent that a major hindrance to full understanding of the geology of the Wichita province is the lack of precise ages of crystallization for some of the igneous rocks exposed in the Wichita Mountains. Detailed field, petrographic, and chemical studies of the rocks have led to assignment of relative ages for the major units (Powell and others, 1980); however, there is considerable uncertainty regarding their crystallization ages. We are currently involved in a comprehensive U/Pb zircon study of many of the rocks in the Wichita province, and the preliminary results from the Mount Sheridan Gabbro are reported here.

GEOLOGY

Field and subsurface observations indicate that the rocks of the Glen Mountains Layered Complex are the oldest igneous rocks of the Wichita province; however, its age of crystallization is not certain (Powell and others, 1980). The Roosevelt Gabbros comprise a series of biotite-bearing rocks that intrude the Glen Mountains Layered Complex and are lithologically distinct from it. The largest exposure of Roosevelt Gabbros in the Wichita Mountains has been formally named "Mount Sheridan Gabbro" by Powell and others (1980), who also gave petrographic and chemical information. Excellent exposures of the Mount Sheridan Gabbro are found in the Rowe Quarry along Medicine Creek (fig. 35). Dikes and pods of pegmatitic material within the gabbro (fig. 36) are well exposed in the quarry.

The pegmatitic material is composed dominantly of green hornblende, alkalic feldspar, and quartz, with variable amounts of biotite, augite, magnetite, and accessory apatite and zircon. Zircon is found as an accessory mineral in both the Mount Sheridan Gabbro and the pegmatite. Powell and Fischer (1976) suggested that the pegmatites could represent either late-stage segregations of residual liquid from the crystallizing Mount Sheridan Gabbro or the products of assimilate reaction and recrystallization of xenoliths of the Meers Quartzite. Powell and others (1980) stated that the petrographic similarity between the pegmatite and the mesostasis of the gabbro favors a magmatic origin for the pegmatites. Our samples of the Mount Sheridan Gabbro and associated pegmatite pods, for zircon chronology, were obtained from the Rowe Quarry.

PREVIOUS GEOCHRONOLOGIC STUDIES

Several geochronologic studies, including U/Pb zircon studies from the Wichita Mountain granites and Carlton Rhyolite (Tilton and others, 1957, 1962), were conducted in the Wichita Mountains during the late 1950's and 1960's. All ages discussed here are approximately recalculated to modern IUGS decay constants after Steiger and Jager (1977) and Dalrymple (1979). The Glen Mountains Layered Complex has been dated by the K/Ar method on whole-rock samples and plagioclase separates (Burke and others, 1969). These measurements yielded average calculated ages of 730 ± 15 m.y. from a troctolite and 509 ± 10 m.y. from a gabbro. The age of the Mount Sheridan Gabbro has been determined by K/Ar dating of whole-rock and biotite samples (Burke and others, 1969) and by the Rb/Sr method on biotite (Tilton and others, 1962). The K/Ar measurements by Burke and others (1969) suggest an age for the Mount Sheridan Gabbro in the range of 498 to 520 ± 10 m.y., and the Rb/Sr data of Tilton and others (1962) give an age of approximately 530 ± 30 m.y. However, as Powell and others (1980) pointed out, all the samples dated were collected very close to intrusive contacts with the younger granite bodies and thus were susceptible to thermal overprinting.

The significance of the published radiometric ages is further complicated by the recent paleomagnetic data of Roggenthen and others (1981) on rocks from the Glen Mountains Layered Complex and the Mount Sheridan Gabbro. These samples indicate paleopole positions that correspond to an age of either 1,300 m.y. or 800 m.y. An older age for the Glen Mountains Layered Complex is favored by Powell and Phelps (1977) on the basis of petrologic arguments relative to the amount of erosion of the upper part of the layered complex.

GEOCHRONOLOGY

Magnetic fractions of zircon from the Mount Sheridan Gabbro and its associated pegmatite were dated by the U/Pb method, using standard techniques for isotopic analysis. Techniques for dissolution and chemical separation of U and Pb were modified from those reported by Krogh (1973). Isotopic ratios were measured on a 9–inch-radius (NIMA) mass spectrometer with on-line digital processing. Lead and uranium separates were analyzed on a single rhenium filament, using H_3PO_4 and silica gel. Arrays of an-