

Determination of ophiolitic and nonophiolitic gabbroic rocks in Central Anatolia using the Cr/Si ratio in clinopyroxene

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The geological setting of gabbroic rocks in Central Anatolia are formed the most problematic units in Central Anatolia. The geological features and tectonic situation of these rocks led the researchers difficulties to distinguish their nature and emplacement mechanisms in Central Anatolia. Some of these rocks are interpreted as ophiolitic in origin (Seymen, 1984; Göncüoğlu and Türeli, 1994) and some of them are shown as nonophiolitic intrusive bodies (Kadioğlu and Güleç, 1996a; 1997). The aim of this study is to distinguish the ophiolitic gabbroic rocks from the nonophiolitic gabbroic rocks by the Cr/Si ratio in clinopyroxenes within these rock units in Central Anatolia.

Method

More than 100 thin sections from the gabbroic rocks of Central Anatolia were studied under the microscope. Of these, 20 were selected for mineral analyses, the selection based on the fresh pyroxene minerals. The analyses were carried out using the Electron Microprobe –EMP– (Cameca SX100) at the mineralogy Institute in Clausthal Technical University (Germany). The chemical results of the pyroxene minerals are compared with each other by the ratio of Cr/Si.

Geology

Metamorphic rocks (gneiss, schist, marble) are formed the basement of the area and were obducted by Neotethyan ophiolitic products which both are intruded by felsic and mafic plutonic rocks. Volcanic rocks and young sedimentary rocks are covered these units (Fig. 1). The granitoids range in composition from granite, granodiorite, quartz monzonite to monzonite. Güleç (1994) reported Rb-Sr whole-rock isochron age of 110 ± 14 million years for the Ağaören Granitoid (Fig. 1). The granitoid has enclosed mafic micrgranular enclaves (MME) which

are diorite, quartz diorite and monzonite in composition and suggested that they are products of magma mixing/mingling enclaves (Kadioğlu and Güleç, 1996b). These MME are ranging in size from cm upto meter in size.

The gabbroic rocks are exposed at the east and at the west part of Tuz Lake and formed the main mafic products. They are dark green and dark grey in colour and they are mostly cropped out at the high topography in the area. The gabbroic rocks at the eastern part of Tuz Lake have wide range of the exposure than those of the western part of Tuz Lake. The former are mostly exposed within the granitoid rocks and change to diorite in composition towards the granitoid contacts. The latter are associated with serpentinite, silicic veins and limestone in the region (Fig. 1).

Petrography of the gabbroic rocks

The gabbroic rocks at eastern part of Tuz Lake have holocrystalline texture and they are mainly composed of plagioclase, amphibole and pyroxene minerals

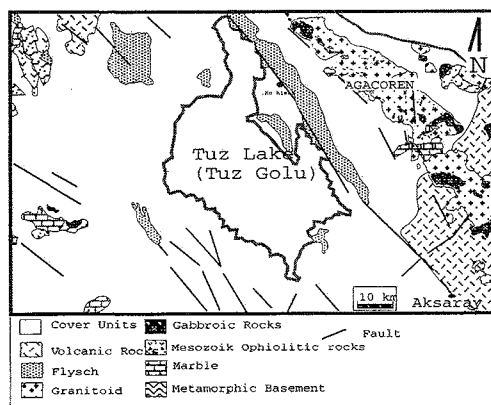


FIG. 1. Geological map of the study area.

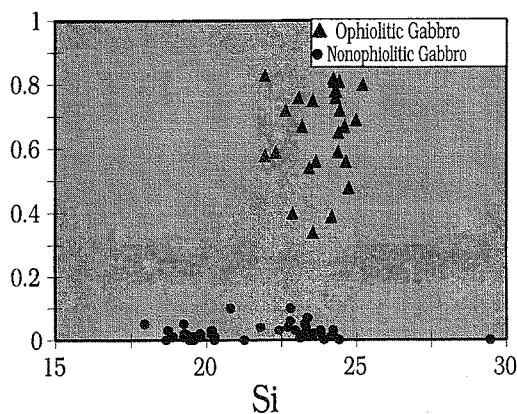


FIG. 2. Si vs Cr contents of the pyroxenes in ophiolitic and nonophiolitic gabbro.

under the microscope. Most of the pyroxene minerals in these rocks are observed as relicts within the amphibole minerals.

The gabbroic rocks at the western part of Tuz Lake have holocrystalline texture and composed of plagioclase and pyroxene minerals. Epidotization and uralitization are typical alteration types of these rocks and the plagioclases are weakly lineated showing a weak metamorphism effect in these rocks.

Mineral Chemistry of the pyroxene

The results of the mineral chemistry of the pyroxene minerals show that there are two groups of the gabbroic rocks on the bases of Cr/Si ratio (Fig. 2.). The gabbroic rocks at the western part of Tuz Lake have Cr contents ranging between 0.3 to 1.0 and the gabbroic rocks at the eastern part of Tuz Lake have Cr contents ranging between 0 to 0.1. Cr contents versus Si diagram shows two different groups of the gabbroic rocks. The high amount of Cr contents

versus Si content are represented the gabbroic rocks at the western part of Tuz Lake and are forming the ophiolitic gabbroic rocks. The low amount of Cr contents versus Si are represented the nonophiolitic gabbroic rocks at the eastern part of Tuz Lake (Fig. 2.).

Conclusion

The gabbroic rocks of Central Anatolia are exposed at the east and the west part of Tuz Lake. The gabbroic rocks at the eastern part of Tuz Lake mostly expose within the granitoid and interpreted as nonophiolitic gabbros. These gabbroic rocks have high amount of Cr (0.3–1.0) versus Si. The gabbroic rocks at the western part of Tuz Lake are associated with the serpentinite and interpreted as ophiolitic gabbro. These gabbroic rocks have low Cr (0–0.1) versus Si.

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