Petrology and Geochemistry of Metamorphic rock from the Kabul Block, Afghanistan

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1. Introduction

Afghanistan is located in the tectonically active collision zone between the Eurasian and Indian Plates, which is the reason that has complex geology. Tectonically Afghanistan is composed of a series of terranes which split from the main Gondwanan supercontinent before colliding, with each other, or with the Eurasian plate (Sengor, 1984; Boulin, 1988; Treloar and Izatt, 1993). The northern part belongs to Eurasia, The Central is made up of accreted fragments of Gondwanan supercontinent, and south East belong to India Plate.

The Kabul Block is a tectonic fragment that occurs at the junction between the Indian and Eurasian plates. Along with the Farah and Helmand Blocks, it is part of a series of NE–SW aligned terranes that comprise the Central Afghanistan Blocks. (Abdullah and Chmyriov, 1977). The Basement rocks in Kabul block are metamorphic rocks covered by sedimentary rocks and intruded by granitoids. Basement rocks are exposed in the central part of the Kabul and these rocks are represented by three formation, called the Sherdarwaza, Kharog and Welayati Formations (Abdullah and Chmyriov, 1977; Karapetov et al., 1981; Bohannon, 2010). which are consist of amphibolite, biotite gneiss, mica schist, migmatites and small amounts of higher-grade granulite-facies rock.

2. Abstract

We are reporting petrology and geochemistry of metamorphic rocks from the Kabul block. The importance for this study is that there is no recent systematic and detailed petrographic and geochemical studies for metagranite and amphibolite from the Kabul block. These metagranites and amphibolites occur in northeastern and southern parts of Kabul city, respectively.

Metagranite cropped out in the northern part of the Kabul city, the boundary between metasedimentary rocks and metagranitic rocks are not clear and difficult to distinguish because of the sediments that are covered the area.

The garnet amphibolite and garnet-bearing mica schist are dominant in south part Kabul block, the amphibolite exhibits metamorphic foliation, The main mineral assemblage of the metagranites are biotite +plagioclase + K-feldspar + quartz ±kyanite ±sillimanite ±rutil ±garnet. Some metagranites contain sillimanite as inclusion in garnet and kyanite in the matrix, suggesting P-T change from sillimanite stability field to kyanite field. Corundum and spinel are rarely observed from highly aluminous domain in metagranite sample.

Aluminum saturation index ($Al_2O_3/(CaO+Na_2O+K_2O)$ in metagranite samples is higher than -1.0, In the Rb against Y + Nb diagram (Pearce et al., 1984), the metagranites show affinities to volcanic arc granites (VAG).

Main mineral assemblage of amphibolites is (hornblende + plagioclase + quartz + epidote + titanite + opaque), and that of garnet amphibolites is similar, except the presence of garnet. The TAS (Total Alkali Silica) & AFM discrimination diagram, all Amphibolite rocks plot in basalt field, with the signature of E-MORB.

The result of FE-EPMA dating of monazite from metagranite indicates ca. 800 Ma, 1400 Ma and 1900 Ma

for the timing of metamorphic event in this area metamorphism. We will add result of zircon U-Pb and discuss P-T-t history of metamorphic rocks in the Kabul block.

