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The Sukari Neoproterozoic granitoids, Eastern Desert, Egypt: Petrological and structural implications

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ABSTRACT

The Sukari granitoid pluton is situated in the southern central Eastern Desert of Egypt and is considered as one of the best examples of the gold–bearing granites in the Arabian Nubian Shield (ANS). It consists of coarse– to medium–grained alkali–feldspar granite, syenogranite and monzogranite intruded the volcano–sedimentary sequences and metagabbro–diorite complex. Geochemically, these granitoids are metaluminous to peraluminous in character. They are characterized by positive Rb, K, Zr and Pb and negative Ba, Sr, P, Nb and Ti anomalies and exhibit similar trace element patterns. Moreover, they show pronounced LREE–enriched patterns and negative Eu anomalies that indicate plagioclase fractionation. The studied rocks are typical of within plate granites generated in tensional environment. They belong to ferroan/A–type granites, particularly A_2–type suggesting post-collisional setting. Their high SiO_2, Al_2O_3 and low MgO contents along with the low Ce/Pb ratios reflect derivation from melting crustal source.

The major structures of the Sukari area encompass Akbar Wahid, Golden Boy, Buthinae and Kaolinitic Faults. The area is characterized by NNE-NE trending shear zone and WNW-EW stress orientation. The mineralized structures contain quartz veins trending mostly EW, NS and NNW; joints with NS, EW, NNE and NNW trends; faults with NNW, NNE, NS and EW trends; and breccia with NNW trend. The kinematic indicators are represented by mylonites, quartz fish and augen structures. Mineralization in Sukari area found as quartz veins, stockworks and brecciated veins.

1. Introduction

The Arabian–Nubian Shield (ANS) occupies the northern portion of the East African Orogen (EAO) and was developed as crust between NE Africa and W Arabia (Fig. 1) during Middle Cryogenian–Ediacaran age (790–560 Ma). It was generated because of collision between East and West Gondwana major fragments at ~600 Ma which leads to termination of the Mozambique Ocean (Meert, 2003; Stern et al., 2004; Fritz et al., 2013). The late Proterozoic ANS represents the suture which occurs at the northern part of the EAO between East and West Gondwana. The EAO occurs within Gondwana as an extensive Neoproterozoic accretionary orogen and collisional zone (Stern, 1994; Collins and Windley, 2002; Cawood et al., 2009; Johnson et al., 2011).

The ANS tectonic evolution involves three stages spanning over 600 Ma (~1100–500 Ma) (Camp, 1984; Abdel–Salam and Stern, 1996; Fritz et al., 1996; Augland et al., 2012). The first stage includes arc terrains accumulation in the Hijaz magmatic arc. In the second stage, the Hijaz magmatic arc was accreted against the Nile Craton. The third stage comprises post–accretion reworking of the accreted arc. The Eastern Desert of Egypt covers a vast domain in the ANS and consists of island arc rocks, ophiolites and granitoids.

The Central Eastern Desert (CED) is covered by two main tectonostratigraphic units. The first is the structural unit which includes gneisses, migmatites, schists and amphibolites. The second unit is the Pan–African nappes which includes low–grade metamorphosed ophiolites (i.e. serpentinites, pillow lavas and metagabbros) and arc metavolcanic–metasedimentary rocks. Syn–tectonic calc–alkaline granites, metagabbro–diorite complex (606–614 Ma) and late– to post–tectonic granites (~590–550 Ma) intruded the two main units (Rice et al., 1993; Andresen et al., 2010). They were emplaced during late Pan–African extensional regime (Greenberg, 1981; Bregar et al., 2002).

NW–trending structural fabrics and structural windows such as Sibai, Meatiq and Hafafit core complexes characterized the CED were developed via sinistral movement along NW–SE shear zone of the Najd Fault System (Fig. 1) (Fritz et al., 1996; Abd El–Wahed, 2008, 2010; Abd El–Wahed et al., 2016). This system comprises a complex set of

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