

## **Petrochemistry and high-precision U-Pb zircon-titanite Geochronology of the Calc-alkaline Lakhshak granitoid rocks from Eastern Iran**

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The Lakhshak pluton is a part of Zahedan-Saravan granitoid belt from the Sistan suture zone represented an episode of Cenezoic magmatism in Eastern Iran. The Lakhshak pluton comprises mainly of plagioclase, K-feldspar, quartz, hornblende, and biotite and subordinate zircon, titanite, allanite and opaque. It is granodiorite in composition with SiO<sub>2</sub> content from 64.4 to 67.4 wt% and represents granular texture. Zircon and titanite U-Pb dating from two samples from the pluton yield an age of 29.80±0.048 Ma, interpreted as age of crystallization of granodiorite pluton. The Lakhshak pluton was cut by a numerous dykes of monzodiorite and granodiorite. Dykes consist about 20 to 30 percentages of the pluton with NE-SW strike. They mainly comprise of plagioclase, quartz, sanidine, hornblende, biotite and subordinate titanite, opaque, zircon and show porphyry texture. Titanite U-Pb dating yields an age of 28.9 ±0.11 Ma for monzodiorite and 28.11 ±0.69 Ma for granodiorite dykes. These ages are confirmed with field studies as dykes do not show chilled margin suggesting the pluton rocks were still warm during dyke emplacements. Dykes also exhibit excellent evidence for magma mixing and mingling textures such as quartz ocelli, acicular and mixed apatite morphologies and mafic clots indicating that magma mingling and mixing played a key role during the evolution of dyke parent magmas. The Lakhshak rocks plot in volcanic arc and post collisional granites. Moreover, the termination of marine sedimentation in the Sistan suture zone by middle Eocene time and the beginning of important folding in the Sefidabeh basin at this time are interpreted to be the result of the collision of the Lut block with the Neh-Ratuk subduction complex. Thus, it seems that the parent magmas of the study rocks were formed during the subduction of the last part of Sistan oceanic lithosphere beneath Afghan block and the begging of Lut and Afghan collision.