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Geology and Geochemistry of Subvolcanic Rocks and Faulting in the Roshtkhar Prospecting Area, Northwest of Sangan Mine, Lut Block, NE Iran: Analysis of Controls on Mineralization

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The Roshtkhar Fe-Cu–bearing prospecting area crops out for ~70 km and is host to the Norab iron mine, which is located 75 km northwest of the Sangan mine, northeast Lut block. This area belongs to the Khaf-Kashmar-Bardaskan volcanoplutonic belt in northeastern Iran along the regional E-W–trending Dorouneh fault. The Roshtkhar granitoids have been exploited mostly for their iron resource. There are several outcrops of subvolcanic rocks occurring mainly as dikes in the area, which intruded the Cenozoic granitoids rocks (syenite, monzosyenite, monzonite, alkali granite, monzogranite, and granodiorite). These subvolcanic rocks can spatially be grouped into mafic and felsic dikes on the basis of field relationships and petrographic observations. Petrographic studies indicate that subvolcanic rocks consist mainly of basalt, basaltic andesite, diabase, trachyandesite, dacite, and rhyodacite. Mineralogically, all the studied subvolcanic rocks display porphyritic and textures with mm-size phenocrysts, most commonly of plagioclase, K-feldspar, hornblende, clinopyroxene, embedded fine-grained groundmass with variable amounts of plagioclase, K-feldspar, hornblende, clinopyroxene, biotite, quartz, and opaque minerals. Following repeated field work with sampling and detailed core logging and petrographic studies of more than one hundred samples from different dikes, representative samples were selected for the following analyses. Thirty samples from the subvolcanic rocks in the area were analyzed for bulk-rock chemistry. Major elements were determined by wavelength-dispersive X-ray fluorescence spectrometer using fused disks, and by a Phillips PW 1480 XRF spectrometer at the laboratories of the Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO), Karaj, Iran, respectively. A set of international and Iranian rock standards, including thirty samples, was used for calibration. Trace elements and rare earth element analyses were done by inductively coupled plasma-mass spectrometry (ICP-MS) at the SGS Analytical Laboratories, Canada. Geochemically, they have features typical of calc-alkaline, high-K calc-alkaline to weakly shoshonitic affinity and are metaluminous to peraluminous. Trace element patterns normalized to chondrite and primitive mantle are very similar to each other and show enrichments in LREE relative to HREE and in LILE relative to HFSE, and have negative anomalies of Ta, Nb, Ti, and slightly negative Eu anomalies. Most iron deposits of the Roshtkhar area are located at the intersection between NW-trending subvolcanic dikes and the E-W–trending Dorouneh fault cutting the Cenozoic granitoids of the Roshhtkhar Complex. Based on field work and petrographic features, the subvolcanic dikes induced upward migration of hydrothermal fluids, which leached Fe from the Cenozoic grantoids and subsequently precipitated at the intersection between subvolcanic rocks and the E-W–trending Dorouneh fault.