

Syn-plutonic dykes and magma mingling: an example from the Alvand plutonic complex, Sanandaj-Sirjan metamorphic belt, Iran

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The Alvand plutonic complex is composed of various mafic to felsic plutonic rocks (gabbro-diorite-tonalite-granite) formed by repeated injections of magmas of crustal (anatectic) and mantle origin. Two extreme end-members of magmas in the complex include: 1) M-type magmas generating gabbro-diorite-tonalite suite and mafic-intermediate dykes and 2) crustal anatectic magmas generating S-type granites and related rocks. There are many NE-SW trending microdioritic-microtonalitic syn-plutonic dykes in the complex which in the some places they are disaggregated to mafic microgranular enclaves (MME). Their appearance, mineralogical and geochemical affinities are similar to other dioritic rocks of the complex but they are finer grained, richer in quartz-ocelli and mafic clots and they are more silicic than their coarse grained equivalents. Regarding to field, petrographic, mineralogical and geochemical features a suite of pure anatectic to hybrid and to mantle type plutonic rocks can be distinguished in the Alvand plutonic complex. The dioritic-tonalitic rocks are hornblende-rich (30-50 %) but anatectic monzogranites-granodiorites are hornblende-free. The evidence of hybridization due to magma mingling in the region is better understood by characteristics of mafic end member than felsic one. This is due to volumetric abundance of two original magmas so that felsic magma has been more abundant than mafic one at the time of hybridization, and therefore, the mafic magma has been surrounded by the felsic magma, so that, solidified parts of the felsic magma have been disintegrated into mafic magma. Since that the felsic magma has been near the end of its crystallization (solidification) history its mixing with mafic magma has been limited. The geochemical properties of both of the felsic and mafic rocks of the region have been slightly affected by hybridization process.