A lamprophyric dyke from Milakuh, SW Damghan, Iran

M.R. GHORBANI, G. ROSTAMI AND M. GHADERI

Department of Geology, Tarbiat Modares University, Tehran 14115-175, Iran (ghorbani@modares.ac.ir)

A lamprophyric rock is reported here, for the first time, from Milakuh in northern Iran. The area is a part of Alborz Structural Zone which itself is part of Alpine-Himalayan orogenic belt. Rostami (2001) in his study on the Milakuh mineral deposits, described this rock as a subvolcanic rock with intermediate to basic composition which cuts through Lower Cambrian Barut and Soltanieh Formations. Field and textural characteristics, mineralogy and geochemical composition of the rock (Table 1), all indicate its lamprophyric signature. The followings are some of these features: a) the rock appears as a dyke; b) it shows panidiomorphic texture with euhedral amphibole crystals; c) its mineral constituents and their modal proportions are: plagioclase 45%, amphibole 38%, Fe-Ti oxides 7%, calcite 6%, apatite 2%, biotite 1%; d) the rock consists of a large amount of volatile components (i.e., in fresh sample, L.O.I. is 7.25 wt%); e) it has high concentrations of LILE (e.g., Ba and Sr) and medium contents of Cr, Ni, V, Zn and Pb.

SiO_2	TiO_2	Al_2O_3	Fe_tO	MnO	MgO	CaO
54.5	1.4	12.5	6.3	0.15	5.4	7.5
Na_2O	K_2O	P_2O_5	L.O.I.	Total		
1.9	1.7	0.38	7.25	98.98		
Ba	Sr	Ni	Cr	V	Zn	Pb
440	700	78	80	64	84	36

Table 1: Major elements in wt%, trace elements in ppm.

Some igneous rocks from adjacent areas also appear to have lamprophyric affinities. For instance, Alavi-Naini (1972) reported an intrusive intermediate rock consisting mainly of plagioclase and biotite from Kuh-e-Vatan, some 10 km towards south of Milakuh. Lamprophyric magmatism might also have had a long history in the geological evolution of the area. Rostami (2001) found a brecciated tuff unit in horizon III of Soltanieh Formation which contains disseminated particles of fluorite. He ascribed the F-supply that cystallized as fluorite to the concurrent volcanism taking place in lower Cambrian. High F content is yet another feature of lamprophyres. Lamprophyric nature of magmatism in this part of Iran has probably been an important phenomenon in lower Cambrian (i.e., the tuff unit) which continued well in post Cambrian times (i.e., Milakuh lamprophyric dyke). This has important implications on the early stages of mantle-lower crust evolution in northern Iran.

References

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Effect of Fluid-Sediment Reaction on Seafloor Hydrothermal Fluxes of Solutes

E. R. GIAMBALVO[1], C. I. STEEFEL[2], A. T. FISHER[3], N. D. ROSENBERG[2], AND C. G. WHEAT[4]

[1] Sandia National Laboratories, Carlsbad, NM 88220, USA (ergiamb@sandia.gov)
[2] Lawrence Livermore National Laboratory, Livermore, CA 94551, USA (steefel@llnl.gov; rosenberg4@llnl.gov)
[3] University of California, Santa Cruz, CA 95064, USA (afisher@es.ucsc.edu)
[4] University of Alaska, Fairbanks, AK 99775, USA (wheat@mbari.org)

At a site on the eastern flank of the Juan de Fuca Ridge, basement fluid upwells through sediment before exiting to the seafloor. We used the reactive-transport code GIMRT to model the processes occurring in the sediment column (diagenesis, sediment burial, fluid advection, and multicomponent diffusion) and to estimate net seafloor fluxes of solutes. Reactive transport modeling allowed us to use pore water data to assess how reaction between upwelling basement fluid and sediment affects hydrothermal fluxes of Ca, $SiO_{2(aq)}$, SO_4, PO_4, NH_4, and alkalinity. GIMRT provides mechanistic descriptions of biogeochemical processes and therefore also allowed us to assess the extent to which fluid flow rate and sediment thickness control hydrothermal fluxes of solutes in this setting.

At this site the basement hydrothermal system is a source of NH_4, $SiO_{2(aq)}$, and Ca, and a sink of SO_4, PO_4, and alkalinity. Reaction within the sediment column increases the hydrothermal sources of NH_4 and $SiO_{2(aq)}$, increases the hydrothermal sinks of SO_4 and PO_4, and decreases the hydrothermal source of Ca. The effect on the hydrothermal flux of alkalinity is spatially variable.

Two series of simulations in which we varied fluid flow rate (1-100 mm/yr) and sediment thickness (10-100 m) predict that the sediment section will contribute the most to fluxes of SO_4 and NH_4 at slow flow rates and intermediate sediment thickness and to fluxes of $SiO_{2(aq)}$ at slow flow rates and large sediment thickness. Reaction within the sediment section over a range of flow rates and sediment thickness could double the hydrothermal sink of PO_4 and could decrease (by ≤10%) the hydrothermal source of Ca.