The Geochemistry of Basalts in northeast of Darood –Neyshaboor, NE Iran

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Abstract

The basaltic rocks of this case study are located in NE of Darood – Neyshaboor in NE of Iran between 59° 8' to 59° 16' east longitude and 36° 7' to 36° 11' north latitude. The age of these rocks is Silurian and based on naming diagram, the rocks of this studied area are alkali basalt. Different diagrams show the origin of magma which produced sodik alkaline and changed unadoptable elements such as LILE (Ba, Rb, K, Th) which are accepted the intense effect of alteration in their rocks and HIFSE elements (Na, Ti, Ta) are riched which show the source of riche mantle for these rocks, also pb positive anomalies in spider diagrams show the participation of crustal elements in the rocks petrogenes of this region. Tectonical setting of these rocks confirms that these basalts of studied area are intra plate.

Keywords: *Basalt, Alkali basalt, Geochemistry, NE Iran, Neyshaboor, Caledonian*

1- Introduction

This studied area are being located in northeastern of Darood – Neyshaboor in NE of Iran and have coordinate between 59° 8' to 59° 16' east longitude and 36° 7' to 36° 11' north latitude. Geographical position and accessible roads in this studied area has been shown in Fig1.

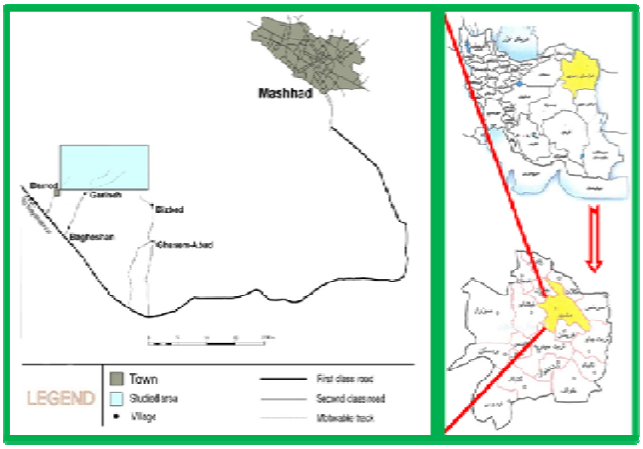

Fig 1- Geographic position and accessible roads in studied area

2- Geochemistry

15 samples analyzed with ICP – MS in Alx-chemx in Canada which the result of major elements chemical analyzing and the analyze result of 38 trace elements.

2-1- Naming based on Geochemical Data

In naming use Floyd & Winchester (1977) for trace elements. Based on these diagrams (Fig 2) and others diagram, these rocks case studied area are located in alkali basalt range.

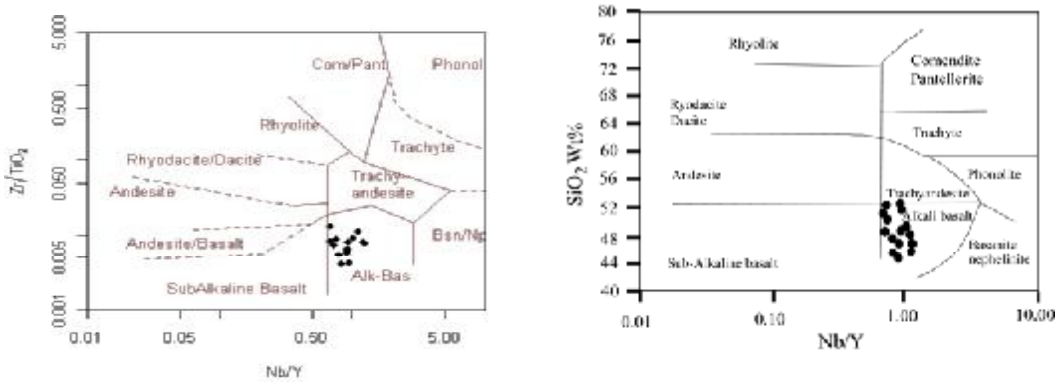

Fig2- placement of rocks studied area in trace elements diagram from Floyd & Winchester (1977)

2-2- Determination magmatic series productive rocks in studied area

For determining magmatic series productive rocks in studied area are based on chemical mineralogical properties which are shown from them changed separating from each others. For these reason used TAS diagram of Irvin & Barayar (1971) and trace elements diagram of Winchester & Floyd (1978). Based on these diagram which are seen in 3A and 3B Fig, the magmatic series of these rocks are alkaline.

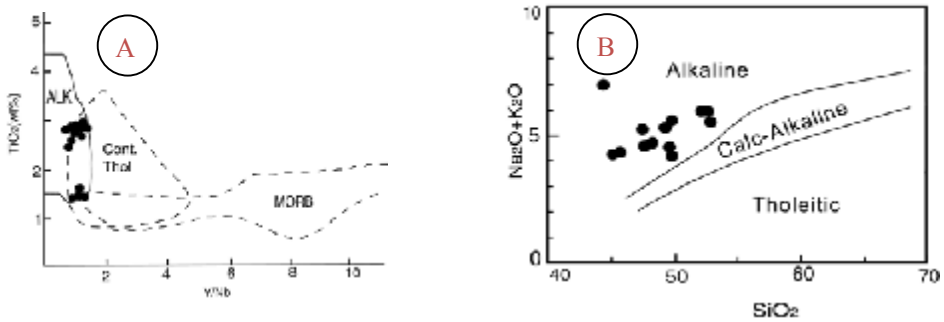

Fig 3- Y/Nb-TiO_2 diagram (Winchester & Floyd, 1978) (A) - TAS diagram (Irvin & Barayar, 1971) (B)

The alkaline igneous rocks based on amount of frequently of sodium and potassium in potasic or sodic of these rocks area used element diagram (Fig 4) it can be concluded that these rocks are belonged to sodic series.

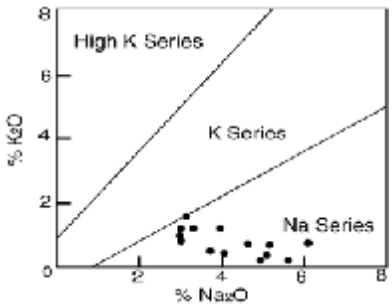

Fig4- K_2O – Na_2O diagram (Irvin & Barayar ,1971)

3) The Study of tectono magmatic issues in Basalts

In latest years most care are about geochemical methods for determining of tectonic places in igneous rocks. Because of alteration act in area major elements have not any use for determining tectonic places, for this reason use the geochemistry of trace elements. Based on Pearse & Cann (1973) and Pearse & Gale (1973) trace elements diagrams are being seen, these basalts are being intra continental basalts (Fig 5).

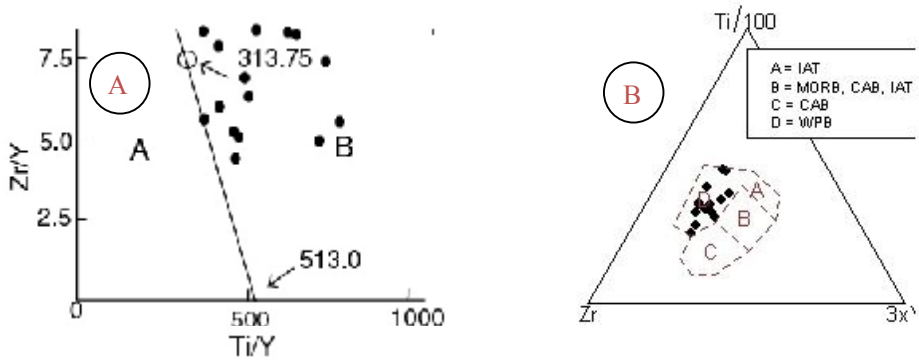

Fig 5- The placement of studied area basalts in Pearse & Gale ,1977 (A) - and Pearse & Cann ,1973 (B)

4- Gensis and formed basalt area

For this reason use Harker diagram for differential coefficient and different diagrams such as(Guo et al, 2003) and (Abdolah et al, 1997).

Based on these diagrams in partial melting samples should be followed by (PM), whereas in differential crystallization phenomena samples should be followed by FC trend. Based on Fig 6, rock samples in this area are followed by FC, which indicated the role of differential crystallization revolute in these rocks area.

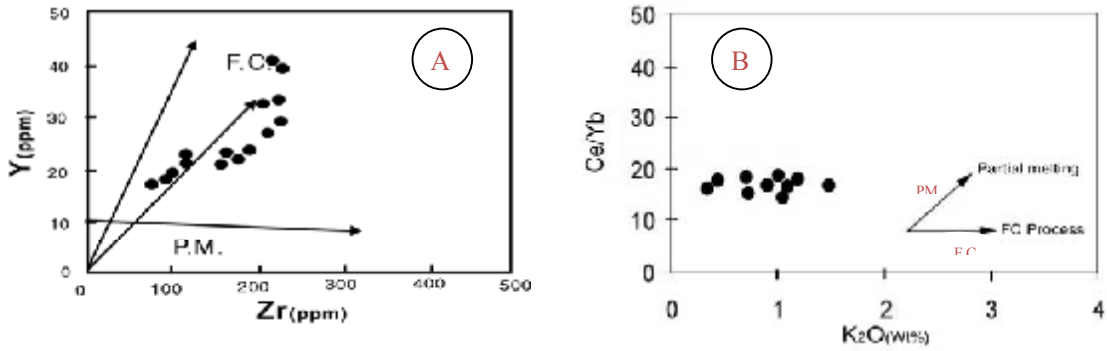

Fig 6- Zr – Y diagram (Abdolah et al, 1997) (A), K_2O – Ce/Yb diagram (Guo et al, 2003)(B)

Differential coefficient is equal with the total mineral's norm of quartz, orthoclase, albite, neopheline and leucite. These diagrams are being drawn for rocks' sample which is relatively intact in this area. Followed that are shown in these diagram, Differential coefficient have regular changes with amount of existence oxides in chemical analysis.

In final stage of magmas' crystallization, some of elements such as Al, Si and Na_2O, in residual liquids are more and in contrast with amount of Fe, Ca, Mg in residual magmas' are less. These qualities are the sign of differentiation magma in studied samples which are being observed greatly (Fig 7).

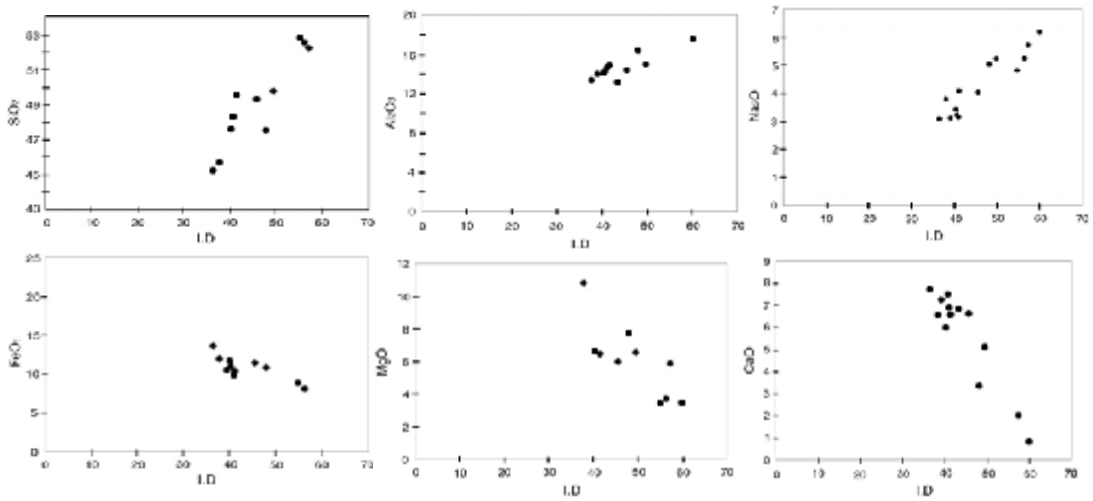

Fig 7- changes diagram of differential coefficient in contrast with some of major elements

5- The changes and magmatic revolutions in basaltic rocks area

The majority of diagrams are being shown for studying of magmatic revolutions. In this part of spider diagrams, the rocks are being normalized in contrast with primary mantle (Sun & McDonough, 1989) and Condorite (Boynton, 1984) which have been used. Followed on Fig 8A, positive anomalies of Pb are being shown that crustal composite participation is studied in the petrogensis of the rocks area. Different anomalies and charge in elements such as Rb and Ba in this diagram show the intense of alteration which have been studied in these rocks area.

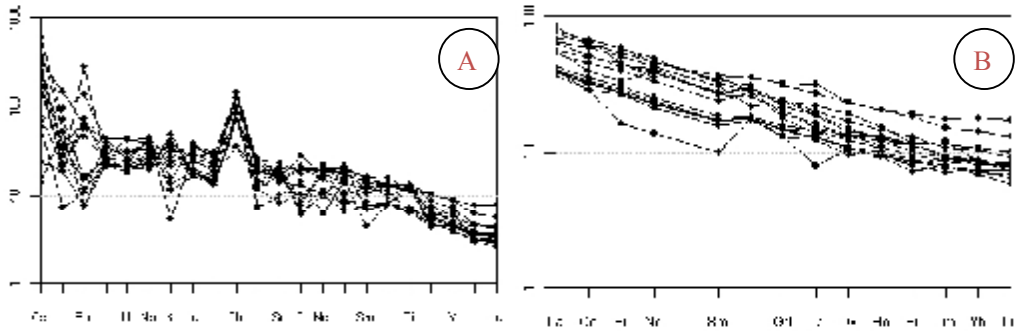

Fig 8- Spider diagram of normalize rocks area in contrast with primary mantle (A) – with Condorite (B)

Based on Fig 8B, the pattern of changing trace element in rocks area are parallel which confirm individual origin and differential crystallization are being determined as a base of them. Gentle slope of REE in these diagram confirm these issues that mafic and ultramafic rocks are studied in continental basalt type. In better word REE in these rocks accompanied with increasing atomic number which show more relative reduction of them.

7- Conclusion

- Based on naming diagrams, rocks studied areas are alkaline basalts.
- The origin of productive rocks area are alkaline sodic.
- In tectonical diagrams, following basalts are the specification of intra continental basalts.
- Spider diagrams of basaltic rocks area show LILE elements are different anomalies which are accepted the alteration of these rocks.
- Rocks areas are composed of individual origin partial process are the main factor to forme the rocks area.
- Productive magma of these rocks studied areas are organized with uplifting in the same time.
- In order to determine the age of these studied area formation by geological survey organization, we can considered them with Caledonian phase.

8- References

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Fig 3- Y/Nb diagram Winchester & Floyd, 1978(A) - TAS diagram Irvin & Barayar, 1971(B).
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