Classification and Nomenclature Igneous Rocksof the ZahedanBatholith -South East IRAN

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Abstract

The modal category,Zahedanbatholith rocks within the granodiorite,Granite and quartz monzonite placed.Classification based on normative feldspar,therockswithin the granodiorite - granite and tonalite are.Chemical classification,Zahedan batholith rocks within the granodiorite, granite, diorite and quartz syenite, alkali granite and syenite placed.The chemical classification of Zahedanigneous rocks based on the saturation of the alumina,ZahedanBatholith rocks are Peraluminous.

KEYWORD: Plutonic igneous rocks, the modal category, Classification norms, ZahedanBatholith,South-East of Iran.

Introduction

Zahedanplutonic igneousin the range oflongitude 60˚and 61˚40' eastern longitude andlatitude29˚to 29˚30' North, with an area750Km^2 and the average height of2200mabove sea levelinsoutheast Iranandare located inthe Pakistan and Afghanistanneighboring(Figure 1).

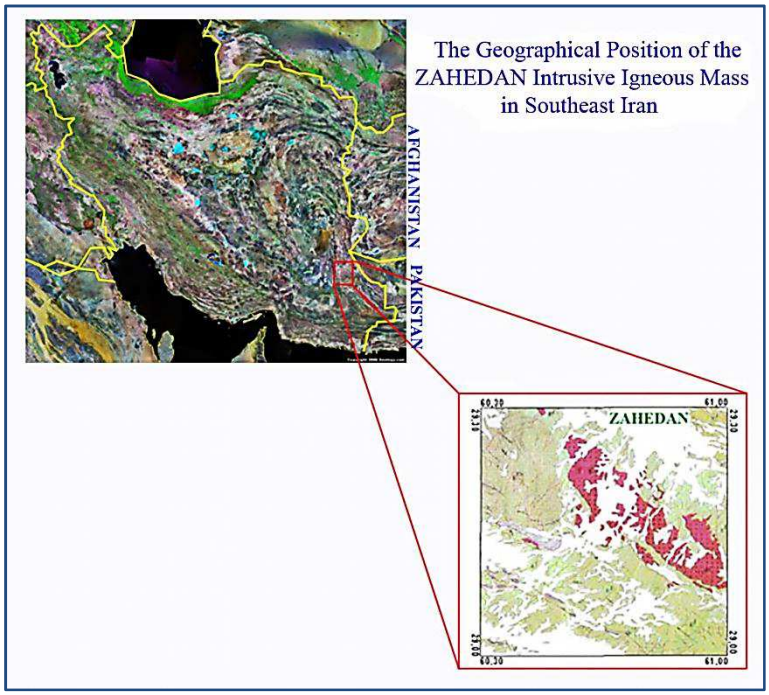

Figure1: Zahedanintrusiveigneousinsoutheastandneighboringcountriesof Iran

Themass of thebatholithsin southernandsouthwesternZahedancityin the SoutheastIran, inthecentralregionofSistan-Suture[1]whichis also calledSistanregionof thejoints, thetwoblocksbroadand strong, butLout rotary motioninWest and the Afghanblock

inEast as apartofoutcropofnarrow^2,low dispersionandLoochan highwithoutcrops extensivelyonthe surfaceappears.

Intrusive igneous mass acme in Zahedan, the igneous peaks with an altitude of about 2565m above sea level is Loochan. Loochan lowest points mainly in southern regions, Have an altitude of about 1700m above sea level is. Loochan peaks and Morgan With an altitude of Zahedan around 2565m and 2403m located approximately parts of the central mass of the batholiths. So batholiths womb was generally high statistical average height above sea level which is about 2200m. The largest mass of igneous outcrop at the surface, Loochan an integrated part of the peak is located in an area of 150Km^2. outcrops Loochan, Thecorners ofthe rectangular shapeoftheNorth and South sidesof the rectangle, respectively Circuits29°10' to 29° 25'northandeastern border sit to the west ofthemeridian of 61°40' to 61°45' Eastaregiven(Fig.2).

Ways to access the broadest outcrops of Zahedan Batholith

Loochan Outcrops(The most extensive outcrops of Zahedan Batholith) of southern and south-western access route includes about 10 miles of paved roads, the degree of a hermit - Khash and rural paved road about 20 Km south of Faizabad - e - Loocho and Rahmat Abad. Access to the western side of the batholiths Loochan about 30 km asphalt road in Zahedan - Khash and about 12Km of paved roads and 10Km of rural road sand Qatarkhanjak - Rural Ebrahim Abad. In this area, adjacent to the batholiths contact and regional metamorphic schist's Loochan with igneous - metamorphic rocks older batholiths metamorphic visible. Access roads tothenorth of the batholiths Loochan, Goorbandrural pavedroad length of about20km(distance to faultvillageGoorband3at the end ofthe valleyof the same name) isSiyadakto the village. East side of road access to the village GharibAbad Loochan batholiths and eastern highlands Loochan and Morgan, about 20km(Fig.2).

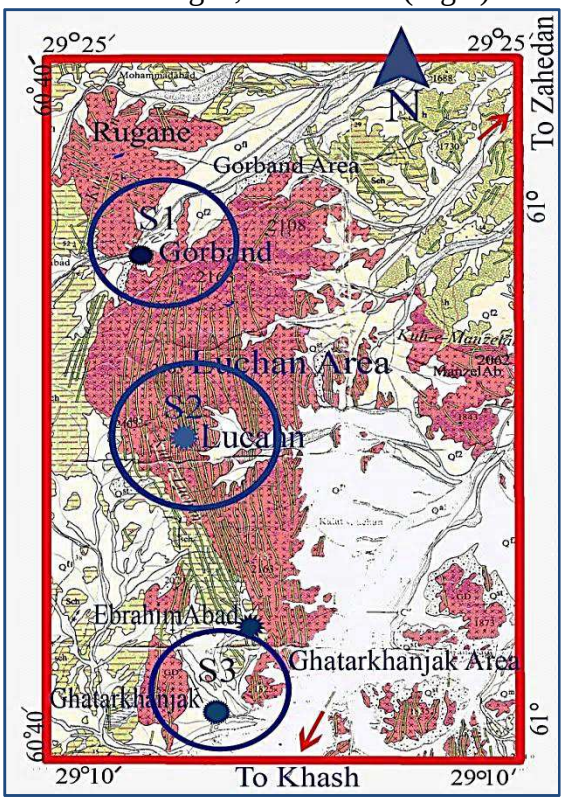

Figure 2: Topography the Geographical Scope of the mass of ZahedanPlutonic Igneous and Road to outcrops Loochan Batholith

Climate specificities in the South East of Iran

Specificitiesof Climate geographical limitmassof igneous intrusionsZahedan, hot and dry(Fig.3) with drastic changes indaily temperature and annual areaof Climatologyinthe border desert climate -semi-desertis located[3].

Figure 3: Desert climate and vegetation cover in a small geographic areaZahedanBatholithinSouth East Iran

Specificities of the regional climate, plays a major role in the degradation and erosion of rocks and thus make certain geomorphological structure of the play. Low humidity, high temperatures and a wide range of temperature changes, especially during the day and seasons as the most important form of degradation phenomena Temperature cleavage and the water content in the cleavage of water and ice cleavage phenomenon has led to the degradation rocks occurred mainly in physical form, Performance of physical weathering chemical weathering in the region is evident.

History of geological studies in the South East of Iran

Studies on the geological history of the South East and intrusive igneous mass Zahedan published field studies Camps and Griffis(1982)[4], Berberian et al. (1982)[2], Tirrul et al. (1983)[1], McCall(1985)[5] and... Begins. The dimensions of the batholith varies between stocks and dykes. The extent of intrusive igneous mass of Zahedan Garaghe Mountain in the mountains northwest of Boug Mountain - Mirjaveh near the border with Pakistan and Iran, about 200 kilometers[6]. Area about 250 km long and extends longitudinally Saravan are. Based on measurements of argon and potassium Zahedan examples granitoid[4] to determine the age of rocks formed about 32 million years for the time being.

ThegraniteofZahedanagewithMatchesK-Ar,about31-33millionyearsisCalculatedtheupperEocene – Oligocenebeginning. Itformsthetectonic events intheLout Block, theWestHelmand Block(Afghanistan) in theEast[2].

Lithology in Zahedan batholith consists of five original rock masses (Fig. 4-A), dykes parallel or nearly parallel (Fig. 4-B), variousxenoliths (Fig. 4-C), of quartz veins and pegmatite's[6] has been divided. The final phase of magmatic activity in the southeastern Iranian city of Zahedanin Tectonicpegmatite's can be seen.

A: B: C:

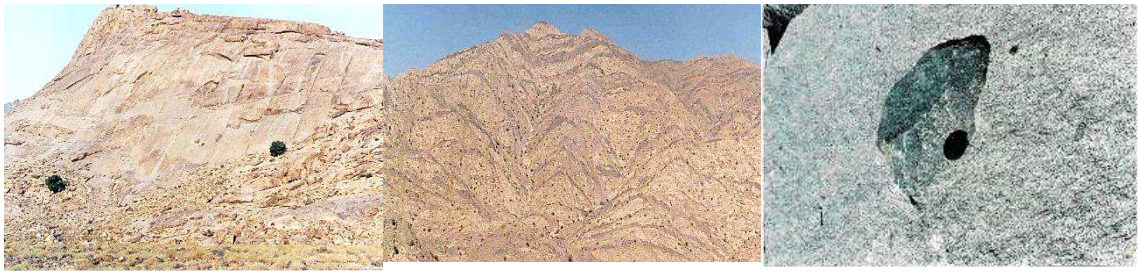

Figure 4: The main components ofZahedan igneous intrusive mass maker pictures (A: The Felsicmain mass, B:Mafic dyke, C:XenolithsVariety in igneous origin and metamorphosed or sedimentary origin)

Modal classification of igneous intrusions in Zahedan Batholith

Lithology in the area Batholith Loochan Into five categories Included: Plutonic igneous rocks original mass Loochan integrated, Parallel dykes or Roughly parallel to the main mass of igneous rocks and Surrounding rock(non-igneous)have infiltrated. Xenoliths available in a variety of igneous mass, Consists of quartz veins and pegmatite masses are classified. The final phase of the Tectonic pegmatite's magmatic activity is seen.

Discussion

Intrusive igneous rock mass manufacturer of Zahedan, generally medium-grained are. The main structure is of granular texture (granular in texture). Various tissues Porphyritic, perthitic, granophyre,skeletal, pegmatitic and Context aplitic it represents.

Classification NormativeLoochan igneous rocks

To classify igneous rocks of the Zahedan Batholith In terms of modal category,According to the lithology in the region,(Mass basic dykes, xenoliths)relevant statistical samples of each lithology for sampling is determined.After harvesting, the samples were prepared from thin sections.After identifying andThe manufacturer determines the type of minerals in rock thin sections were prepared andDetermine the original rock minerals in this section ,Using a timer device locations,Volume percent of the ore minerals were determined by the manufacturer. Then use the appropriate table's modal,Indices for classification andIntrusive igneous rocks were named.And finally,using appropriate diagrams,Classification andNaming the underside of igneous rocksBatholith was conducted in Zahedan.

ModalClassification of igneous rocks Zahedan diagram Q,F. Alk,F. Plg[7]

ModalClassification and Classification mass of intrusive igneous rocks Batholith Zahedan diagram Q, F.Alk, F. Plg[7,8]known asStreckeisen diamond diagram was used.This diagram called quantitative mineralogical classification of feldspar-bearing rocks[9] presentedthe parameters defined by Q, A, P.

The triangular Streckeisen diagram intrusive igneous rocks in ZahedanWithin the granodiorite andGranites are few sectors[14] (Figure 5).

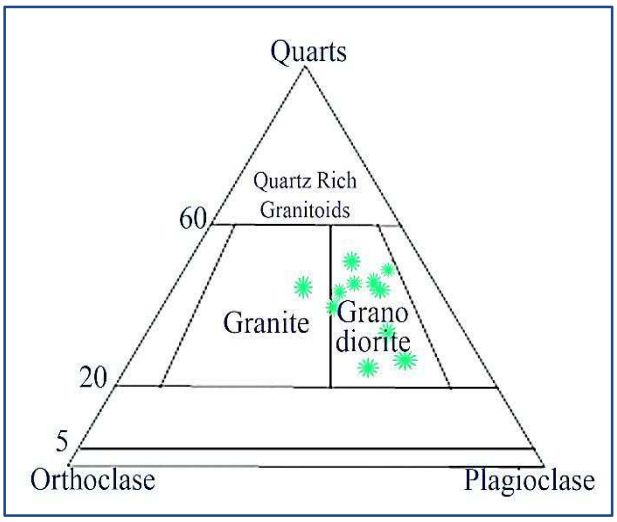

Figure 5: Streckeisen Trio Diagram (1979) and the location of the intrusion of igneous rocks Zahedan[10]

The triangular diagram Streckeisen for Zahedanigneous rocks igneous intrusions in Zargoly mountain range in the homes of granodiorite, granite andthe lower part of the house are placed in quartz-rich granitoid[11].The Streckeisen triangular diagramLoochanbatholith is the area of the granodiorite, granite and quartz Monzonite take place(Figure 6).

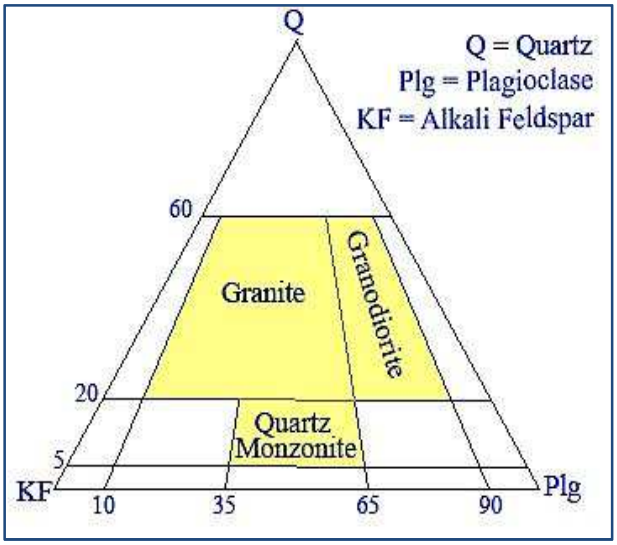

Figure 6: Streckeisen Trio Diagram (1979)AndPosition intrusive igneous rocks LoochanCompositions QAPF diagram of StreckeisenModal (1979)

Classification NormativeLoochan igneous rocks

For Normative Classification of igneous rocks the intrusion in Zahedan Based on the statistical distribution of the rock band Samples for chemical analysis the standard Contact Position of the right (station studies presented above) were harvested. Chemical analysis of rockschemistry was done by a reputable company (Table1).Figures calculated using the Norm, Norm was calculated for each group of rocks.Using appropriate diagrams normative ranking, classification and nomenclature of igneous rocks of the Batholith in Zahedan.

TABLE1.Chemical analysis ofsamplesofintrusiveigneousZahedanmass

Sample NO.	SiO2	FeO+Fe2O3	Al2O3	MgO	CaO	Na2O	K2O
L1	60.73	2.82	21.36	5.42	4.97	3.45	2.25
L2	68.23	2.33	16.51	6.65	3.02	2.98	2.25
L3	59.78	2.61	17.87	9.40	5.90	3.29	2.17
L4	65.10	2.42	17.28	6.79	4.05	3.02	2.34
Z1	62.88	4.68	17.42	1.26	3.68	3.33	3.41
Z2	68.3	3.12	14.50	1.83	2.11	2.96	4.17
Z3	68.26	2.96	15.49	2.25	2.56	3.23	4.07
Z4	66.6	3.37	15.20	2.46	3.32	2.75	3.32
Z5	63.0	5.11	16.20	3.89	2.94	1.93	3.92
Z6	78.8	0.92	10.00	0.23	1.26	2.84	5.58
Z7	77.5	1.47	13.30	0.90	1.21	2.55	5.48
D1	70.0	2.70	15.8	1.02	3.03	4.41	2.66
D2	58.1	5.20	15.6	3.64	5.60	3.70	2.91
K1	67.1	3.59	15.79	1.27	3.46	3.79	2.85
K2	68.2	3.16	16.10	1.75	3.44	4.20	1.95
K3	56.9	6.16	24.30	1.96	3.12	3.48	2.45
K4	61.4	4.78	18.90	1.76	3.36	3.68	2.23
K5	67.5	3.58	15.50	1.37	3.46	3.80	3.36
K6	54.8	6.52	26.20	2.02	3.01	3.12	2.86
K7	59.9	5.31	21.70	1.68	3.18	3.29	2.34

1: Sample NO. L-1/L-4: Analysis of Loochan Granitoid. (Analyzer: TiranSutton Co.)
2: Sample NO. Z-1/Z-6: Analysis of Zahedan Granitoid. (Analyzer: Ab and Khak CO.)
3: Sample NO. D-1/D-2: Analysis of ZahedanDyke. (Analyzer: Ab and Khak CO.)
4: Sample NO. K-1/K-7: Analysis of Katkhanjak Granitoid. (Analyzer: KemiaSang CO.)

Classification NormativeLoochan igneous rocks By Alb-An-Or diagram[12]

Intrusive igneous rock mass classification normative Zahedan,Considering the rocks of silica are rich, Triangular diagram of O'Connor(1965) with the condition (Silica-rich rocks, quartz> 10%) was used as Feldspar Triangle diagram.Albite values of the three vertices of the Albite (Alb), Anorthite (An) and Orthoclase (Or) the calculations are flawed(Figure 7).

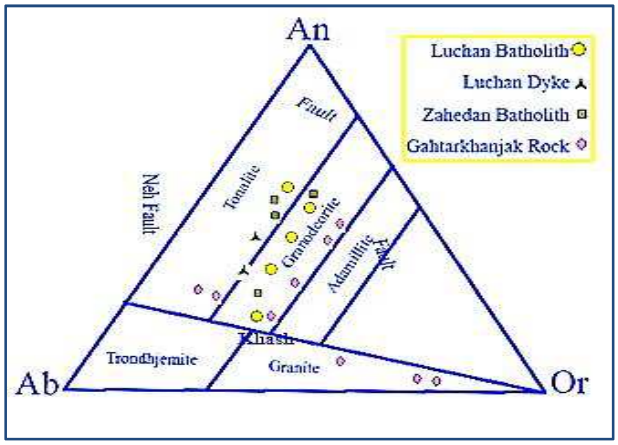

Figure 7: Diagram normative feldspar and igneous rocks studied situations where

Figure Albite - Anorthite - Orthoclase normative by O'Connor(1965) is presentedShows the mass of plutonic igneous rocks forming the case study on South-East IranWithin the granodiorite, tonalite and granite are placed (Figure7).

Chemical Classification of igneous rocks in the intrusion Zahedan

Chemical classification and nomenclature of igneous rocks in the study area classification and presentation diagrams were used by different specialists.

Classification of Chemical by Cox et al. (1979)[13]

Dimensional diagram (Cox etal.1979), wt.% SiO2 (X-axis) versus weight percent total alkali K2O+Na2O(Y-axis) are located .According to this chart(TAS version[13]), igneous rocks in the area Loochanand located within granodiorite and diorite are Qatarkhanjak. And stone dykes intruded in the Granodiorite and dioriteLoochan batholith are in the range (Figure 8).

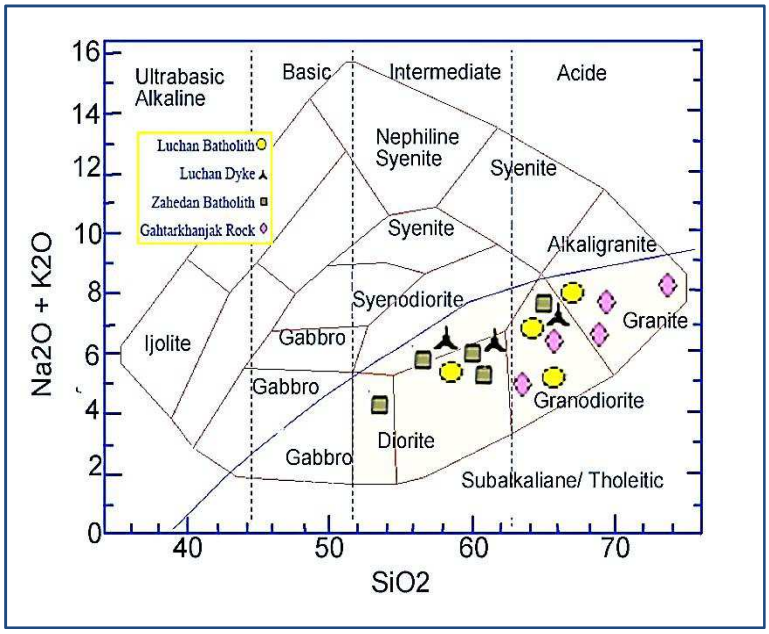

Figure 8: Cox et al. chemical graphs and position of the rocks in the study area

This chart also help Alkaline and sub-alkaline magmatic series are separated from each other. Boundary between the two series By Miyashiro (1978)[14] was presented. All the studied rocks in the batholith Loochan, Take place within the sub-alkaline magma series (Fig. 8).

Classified according to the diagram provided by Debone and LeFort (1983)[15]

This category naming intrusive igneous rocks Parameters are set according to cationic.The x-axis, Parameter p and

The y-axis, Q parameter are defined: P = k - (Na + Ca)&Q = Si/3 - (K+Na+ 2Ca/3)

The following Position diagramof rocks in the study area based on the diagram of Debone& LeFort(1983) shows.The Igneous rocks Loochandiagramwithin the granite and quartzsyenite,and rocks forming the dykes intruded areaLoochan within the quartz syeniteand plutonic igneous rocks in the area Qatarkhanjak take place within the granite.

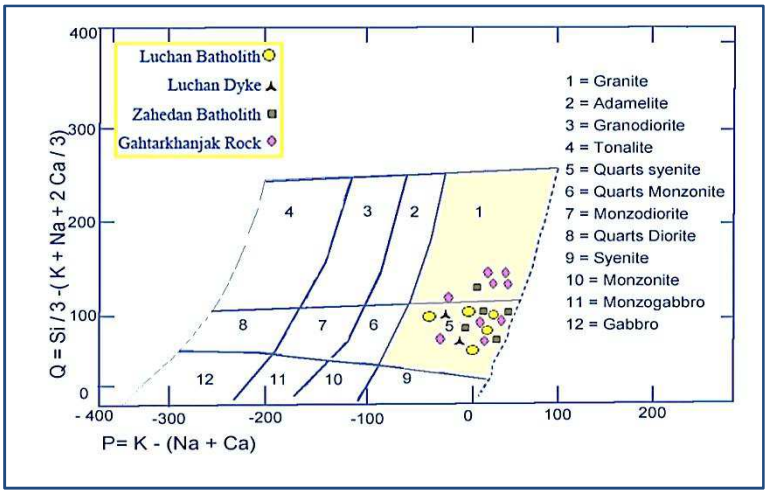

Figure 9: Location of Zahedan batholith intrusive igneous rocks action Debone and LeFortdiagram

Classified according to the diagram provided by De La Roche, Leterrior, Grand Claude, and McCall (1980)[16]

The De La Roche et al.(1980)diagram ofCationic parameters R1-R2 are defined as follows. The X-axis, The parameters R1 and the y-axis, R2 parameter calculated in the above diagram is pasted. Thus, the position of the stone floor De La Roche &et al. diagram is displayed: R1=4SiO2+11(Na+k)-2(Fe+Ti)&R2=6Ca+2Mg +Al

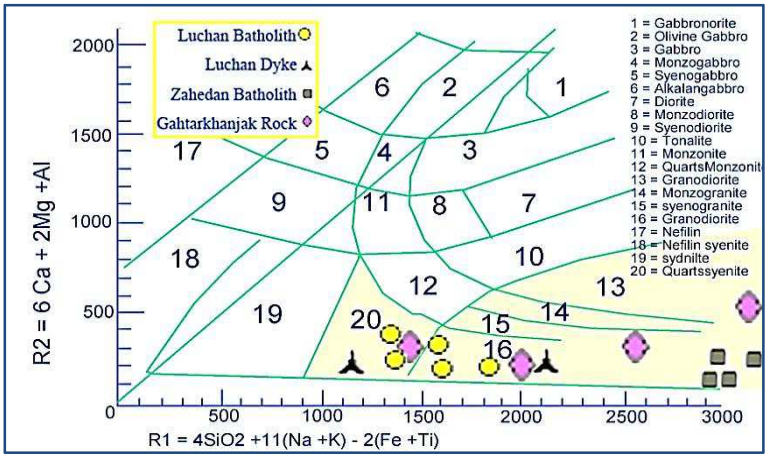

Figure 10: Location of Zahedan batholith intrusive igneous rocks action diagram De La Roche& et al.

Based on the Classification diagram caution provided Zahedan intrusive igneous rock massin the area of alkali granite andthe rocks QatarkhanjakWithin the granodiorite andAlkali graniteCreator and stone dykes Syenite and quartz syenite are in the range.

Classified according to the diagram provided by Maniar & Piccoli (1985)[17]

One particular method for Classifying and labeling Chemicals igneous rocks, Based on the amount of aluminum in rocks by Maniar & Piccoli(1985) is presented. In this diagram Igneous rocks on the basis of saturation of alumina, GroupsMeta Aluminous, Peraluminous, Alkaline and are divided into sub–alumina[17] (Shand-1943)[18].

This diagram is based on the parameters A / CNK in the X-axis and A / NK is regulated in the Y-axis:

A/CNK= Al2O3 /(CaO +Na2O + K2O) & A/NK= Al2O3 /(Na2O + K2O)

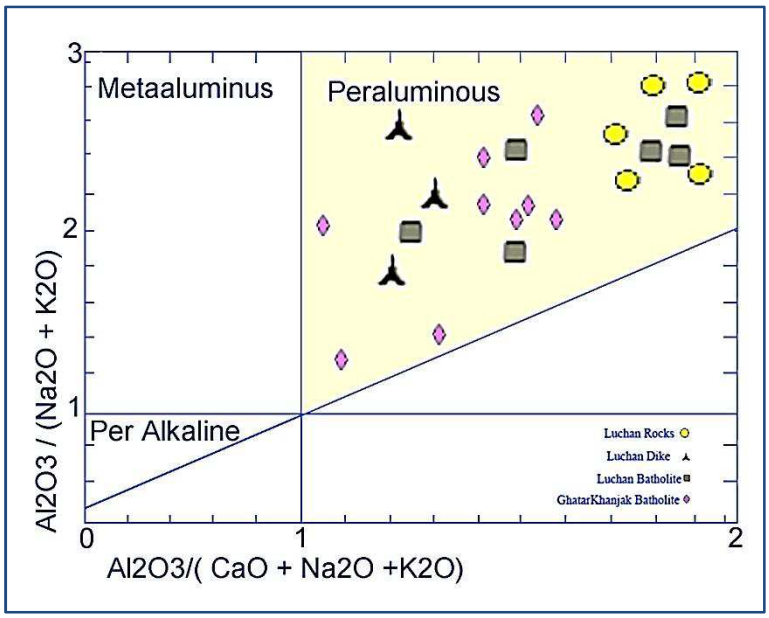

Figure 11: The position of the rocks in the study area famous diagram (Shand's diagram)

Shand's diagram(above diagram), intrusive igneous rocks in the area of Zahedan,Range are Peraluminous.

The findingthe results ofKurd et al. (2009)[19]and with Study findings Boomeri - Lashkaripour (2004)[10]And the results of field studies Hosseini (2003)[20]thatare to say : Field evidence, petrographic and geochemical evidence suggests nature, especially alkaline and Peraluminous granites Zahedan ,Correspond.

Results

ClassificationBased Modal on Streckeisen triangular diagram (1979)for internal igneous rocks saturated with silica,igneous rocks forming the ZahedanBatholith (masses and dykes)within the granodiorite, granite and quartz monzonite are.

Normative Classification, Based on O'Connor triangular diagram(1965)normative diagram called feldspar,Plutonic igneous rocks of the region under studywithin the granodiorite - granite and tonalite are.

In chemical classification,According to the Coxdiagram(1971),Zahedan batholith rocks within the granodiorite, granite and diorite (some dykes) are placed.

Classification diagram of cationicBased on the Debone and LeFortdiagram(1983)The Rocks are in the range of granite and quartz syenite.

The classification is based on the diagram De La Roche et al.(1980),thescopeRocksof the alkali granite, granodiorite, syenite and quartz syenite are.

According to Shand diagramthe chemical classification of igneous rocks is based on the saturation of the alumina

Batholith rocks manufacturer Zahedan in Iran's South East area are Peraluminous.

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