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The study of dual entity of alkaline - calcalkaline magma origin in plutonic rocks in Aftabrou area, North West of Saveh, Arak

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Abstract

Aftabrou plutonic rocks outcropped in 70 km North West of Saveh and are in Orumiyeh-Dokhtar volcanic zone, which have plutonic to sub plutonic rocks with after post Eocene age and including with older volcanic rocks (Middle to late Eocene). Plutonic rocks consist of granodiorite and have minerals such as plagioclase (albite-andesine), alkaline feldspar (orthoclase), amphibole (hornblende) and quartz with granular texture and sometimes poikilitic and graphics textures. Sub plutonic rocks consist ofdiotite and have minerals such as plagioclase (andesine- labradorite) amphibole (hornblende) and sometimes, quartz with porfiroid, intergranular texture. To determine tectonic setting, petrogenesis and magma series was used the results of geochemical analysis (XRF and ICPMS) for draw geochemical diagrams. Tectonomagmatic graphs show both magmas are related to subduction zone in active continental margin. Low frequency of Ti, Sr, P elements and positive anomalies of K, Rb, Ba, Th, La, U elements in the spider diagrams patterns that normalized by chondrite and primitive mantle shows that origin of plutonic rocks are molten with crustal protolith and crystallization of it. Sub plutonic rocks are result of asthenosphere molten, So that in subduction zone, reduce pressure and subducted fracture wedge cause to go out asthenosphere melt near the rift and make alkaline magma.

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Introduction

Wide volcanic activity in Tertiary is evident in all places in Iran except Zagros and kopedagh (Nabavi, 1976, Darvish Zadeh, 2004). Orumiyeh-Dokhtar zone is obvious manifestations of this condition (Nabavi, 1976, Moein Vaziry, 1996, Emami, 1997, Darvish zadeh, 2004) and recorded the culmination of these activities during the Eocene (Moein Vaziry, 1996). Geochemical and petrographic studies of igneous rocks can determine the tectonic environment of magma forming in their time. North West Saveh region in the geological structure are in the western part of Orumiyeh-Dokhtar magmatic belt (Nogol Sadat, 1984) and includes a large volume of volcanic eruptions during the Eocene and after it (Masoudi *et al.* 1990). Mokhtari *et al* (2014) reported radiation age of granitoid rocks between 28- 39 million years in the North West of Saveh region. In these area younger rocks intrusive to older volcanic unites with Middle to Upper Eocene age (Emami, 1997).

Several studies did in Orumiyeh-Dokhtar belt and especially in North West of Saveh. People like Masoudi and Shabani (1990) explain magmatic for volcanic and plutonic rocks in south Buin Zahra and listed these rocks to calc-alkaline and related to subduction zone in active continental margin. Recently, people like Rafiei *et al.* (2010), Safarzadeh *et al.* (2009), mystical and colleagues (2014), Amini *et al.* (2014), Palmer and colleagues (2012) have done research in the area. All of these say magma manufacturer in igneous rocks are calc-alkaline and associated with subduction zone in active continental margin. Dorozy and Vosoughi Abedini (2009) describe the role of crustal contamination in the genesis of calc-alkaline magma. Sabzian and Masoudi (2011) is also study in part of the surveyed area and considered volcanic rocks related to active continental margins.

However, rocks with calc- alkaline origin has been observed close to the rocks with alkaline origin in the area. Aghazadeh & Castro (2011) study in the similar area on the western part of the Orumiyeh-Dokhtar zone in the sungun region and have offered dual entity alkaline- calcalkaline trend for igneous rocks in the area. This study used petrography and geochemical data to investigate the presence of calcalkaline and alkaline magmas in the area.

Material and methods

Sampling and analysis techniques

After collecting and verifying the information, reports and maps of the area, check field study and survey in the various stages, select about 100 samples of the plutonic rocks. The 35 samples that have lowest degree of weathering select for preparation thin sections for petrography study that do with Olympus Microscope, model BH- 2 in Isfahan University. After microscopic studies for geochemical studies select 16 sample and sent for ICPMS and XRF analysis to Zrazma Company in Tehran.

Software

The results of analysis using software GCDKIT 2.2.1 for draw the geochemical diagrams. For separation of Fe^{2+} from Fe^{3+} used Irvin and Baragar's (1971) method. Abbreviations of minerals were adapted from Kretz (1983). In addition to Petrographic studies for determine the composition of minerals use microprobe analysis and the results of it will be publish in separate article.

Results and discussion

Geological and geographical location of the region

Aftabrou plutonic rocks are in Saveh area. That is part of Orumiyeh-Dokhtar zone in the sungun region and has offered dual entity alkaline- calcalkaline trend for igneous rocks. Study area is located in 50˚03'51" to 50˚04'25" Longitude and 35˚29'11" to 35˚28'52" latitude in Saveh 1/100 000 Geological map. The study area rocks are mainly volcanic rocks with intermediate composition (mainly andesitic) and have Middle to Upper Eocene age. In some places plutonic rocks are commonly protrusions in these rocks with lower age (Oligo-Miocene) and granodiorite to diorite composition (Masoudi, 1990, Dorozyand Vosoughi Abedini, 2009, Sabzian, 2011; Aghazadeh & Castro, 2011). These two groups' rocks are seen roughly in northern of the geological map in Fig. 1. Diorites are older than granodiorites. They ages were determined by Kaya *et al* in 1978 about 39 million years ago (Emami *et al*., 1997). Diorites have been same ring around granodiorite. All outcrops in the study area Related to Cenozoic period and are along the complete closure of the Neotethys ocean. Older rocks are not exposed in the region (Emami, 1997). These rocks are in the Orumiyeh-Dokhtar zone and result of the collision and subduction Arabic plate under Subcontinent central Iran (Berberian & King, 1981; Mohajjel & Fergusson, 2000; Ghasemi & Talbot, 2005). As shown in Fig. 1, two groups fault with parallel east-west trend cut these. joints units and fracture systems are evident in these rocks. Neogene and Quaternary sedimentary units relatively covered large portion of the South and East of the study area and have a significant expansion in it (Fig. 1).

Table 1. The results of XRF and ICPMS analysis of plutonic and sub plutonic rocks in the study area.

SAMPLE	SiO2	TiO2	Al2O3	Fe2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	Ba
AF-43	59.01	0.8	15.5	2.3	4.71	0.23	3.58	7.44	2.73	5.48	0.49	425
AF-141	57.49	0.41	11.1	2.12	13.54	0.28	4.68	0.08	0.03	3.5	0.05	756
AF-41	56.42	0.49	10.93	2.12	15.19	0.2	0.9	0.03	0.02	3.2	0.09	663
AF-18	58.67	0.86	14.99	2.36	5.01	0.18	4.85	0.81	3.96	3.85	0.55	985
AF-42	58.88	0.86	15.41	2.12	2.36	0.16	3.06	7.6	3.14	3.08	0.31	559
AF-142	60.54	0.8	13.58	1.99	2.25	0.18	2.65	3.98	0.26	3.1	0.24	945
AF-242	59.45	0.8	15.46	1.96	2.01	0.18	3.38	5.61	2.88	3.76	0.25	925
AF-13	66.54	0.49	17.18	1.96	0.65	0.25	1.1	3	2.05	4.3	0.85	956
AF-113	65.51	0.59	13.18	2.12	1.05	0.19	1.75	3.13	3.63	3.15	0.2	621
AF-5	69.27	0.46	13.42	1.89	0.85	0.19	2.3	1.56	1.51	3.79	0.09	256
AF-105	68.87	0.57	13.38	1.92	0.92	0.11	1.21	2.61	2.88	3.55	0.12	860
AF-3	66.72	0.75	13.71	2.26	1.36	0.91	4.36	4.98	4.49	2.2	0.61	785
AF-103	64.67	0.62	13.34	2.12	1.37	0.1	1.7	4.32	4.34	1.12	0.18	261
AF-15	75.94	0.83	11.08	0.15	0.07	0.03	0.43	1.11	4.61	1.5	0.0001	94
AF-115	74.65	0.72	10.62	0.11	0.08	0.25	0.35	3.5	4.45	1.1	0.0001	18

Continue of table 1.

SAMPLE	Co	Cr	Cu	Nb	Ni	U	Ce	Zr	Pb	Rb	V	W
AF-43	17	15	51	5.9	24	1.9	21	71	13	31	143	0.49
AF-141	10.2	13	2687	4.9	15	1.2	10	15	32	49	61	0
AF-41	7.8	11	2586	5.1	14	1.2	13	17	28	37	76	0
AF-18	8.5	13	10	9	15	1.7	60	8	5	37	122	0.7
AF-42	15.6	20	131	7.5	24	1.5	24	37	10	40	145	0
AF-142	12.98	18	189	6.1	22	1.6	20	35	16	75	131	0
AF-242	14.3	17	184	6.1	23	1.5	20	35	16	72	131	0
AF-13	10.9	6	83	3.6	12	0.77	21	10.5	21	68	65	0.49
AF-113	12.8	7	83	4.5	13	0.77	26	12	13	30	79	0.49
AF-5	4.6	6	80	3.6	11	0.7	17	12	15	68	65	0
AF-105	5.9	7	50	4.7	12	0.7	21	13	9	41	70	0
AF-3	7.9	10	10	10.5	14	1.5	78	6	2.8	12	112	0.8
AF-103	6.9	8	11	5.7	13	0.7	25	14	3	11	83	0
AF-15	1.4	3	18	6.1	12	1.2	17	10	1	14	16	0
AF-115	1.02	1	20	10.1	11	0.5	8	18	1.5	12	12	0

Continue of table 1.

SAMPLE	Y	Zn	Mo	Ag	Al	As	Be	Bi	Ca	Cd	Dy	Er
AF-43	15.8	123	2.1	0.3	82036	4.7	1	0.1	44386	0.43	2.45	2.04
AF-141	12.5	106	4.1	1.1	58765	5.2	0.8	0.2	1857	0.9	1.89	2.01
AF-41	16.3	108	3.4	0.4	57844	5.2	0.8	0.2	2945	0.1	2.12	2.47
AF-18	23.2	94	0.2	0.1	79344	0.1	1.5	0.1	8152	0.1	4.08	3.56
AF-42	15.3	76	1.2	0.2	81603	1.8	1.1	0.1	48114	0.19	2.52	1.76

SAMPLE	Y	Zn	Mo	Ag	Al	As	Be	Bi	Ca	Cd	Dy	Er
AF-142	10.9	75	1.8	1.1	71876	1.8	1.1	0.1	37894	0.16	2.25	1.12
AF-242	9.6	74	1.6	0.96	81865	1.8	1.1	0.1	27456	0.13	2.01	1.21
AF-13	19.6	115	1.4	0.98	69773	0.99	1	0.99	15625	0.1	2.36	3.56
AF-113	26.8	117	0.9	0.1	69773	0.99	1	0.99	25351	0.11	3.18	4.16
AF-5	13.6	35	.1.2	0.8	71025	0.1	1	0.1	10562	0.1	1.85	1.01
AF-105	20.9	37	0.8	0.9	70842	0.1	1	0.1	21879	0.11	3.22	3.36
AF-3	33.2	29	0.15	0.08	72568	0.98	2.6	0.09	45698	0.12	6.8	6.85
AF-103	27	38	0.4	0.1	70641	0.1	1	0.1	32230	0.12	3.95	4.24
AF-15	20.4	10	0.3	0.1	58684	0.1	0.9	0.1	11831	0.1	3.18	3.12
AF-115	16.2	25	0.7	1.96	56236	0.15	0.4	0.19	4895	0.1	1.56	1.98

Continue of table 1.

SAMPLE	Eu	Fe	Gd	Hf	In	K	La	Li	Lu	Mg	Mn	Na
AF-43	0.98	44708	1.97	1.72	0.5	17040	13	23	0.15	12159	950	23192
AF-141	0.39	105000	1.19	0.54	0.5	21651	5	25	0.16	2124	855	255
AF-41	0.45	105500	1.25	0.54	0.5	20630	6	22	0.19	2525	873	159
AF-18	1.47	47212	4.39	0.5	0.5	27704	32	16	0.18	16123	1178	28984
AF-42	1.05	41894	2.14	0.86	0.5	19909	14	8	0.12	11346	883	24099
AF-142	1.63	37895	1.98	0.86	0.5	27569	11	11	0.08	9864	859	1985
AF-242	1.65	38564	1.95	0.86	0.5	29987	11	11	0.09	9368	869	22065
AF-13	0.85	23694	2.6	0.51	0.49	46582	8	8	0.24	5347	1123	15689
AF-113	0.93	29036	2.8	0.51	0.49	25288	12	5	0.29	7340	1148	27827
AF-5	0.81	23568	2.01	0.5	0.5	32568	5	11	0.2	4650	701	11569
AF-105	0.9	26620	2.27	0.5	0.5	31169	7	8	0.25	5390	712	22100
AF-3	1.54	29945	5.6	0.46	0.5	14562	45	3	0.13	18569	1059	34389
AF-103	0.97	31545	3.09	0.5	0.5	7801	13	5	0.3	7390	721	33254
AF-15	0.38	4754	2.21	0.5	0.5	6997	5	2	0.21	1010	194	35334
AF-115	0.1	5687	3.41	0.61	0.5	4562	3	4	0.5	356	38	34125

Continue of table 1.

SAMPLE	Cs	P	Pr	S	Sb	Sc	Se	Sm	Sn	Sr	Ta	Tb
AF-43	14.1	974	3.09	123	0.9	14.1	0.5	3.09	1.1	463.3	0.41	0.24
AF-141	9.3	568	1.25	56	1.02	9.5	0.5	1.49	1.1	16.3	0.26	0.6
AF-41	10.1	421	1.63	93	1.2	10.1	0.5	1.85	1.2	37.1	0.37	0.12
AF-18	13.8	1650	7.75	110	0.7	13.8	0.5	6.44	2.2	191.8	0.65	0.6
AF-42	14.7	1070	3.47	86	0.9	14.7	0.5	3.19	1.3	458.6	0.58	0.27
AF-142	13.2	985	2.56	58	0.8	13.1	0.5	2.46	1.2	326	0.46	0.15
AF-242	12.6	904	2.46	0.58	0.7	12.6	0.5	2.96	1.2	305	0.47	0.16
AF-13	0.42	556	4.36	49	0.8	11.5	0.49	2.75	1.2	225	0.11	0.12
AF-113	0.6	714	3.29	87	0.9	13	0.49	3.67	1.2	279.8	0.19	0.5
AF-5	10.6	485	1.85	35	0.45	11.3	0.5	2.35	1.3	158	0.17	0.28
AF-105	12.3	517	2.43	51	0.5	12.3	0.5	2.83	1.4	240.4	0.24	0.34
AF-3	16.5	1759	12.36	115	0.4	16.5	0.5	7.8	2.7	568	0.66	1.1
AF-103	13.8	678	3.33	101	0.6	13.8	0.5	3.7	1.5	422.4	0.37	0.55
AF-15	4.1	62	2.53	138	0.5	4.1	0.5	3.44	1.1	107.2	0.48	0.37
AF-115	2.8	31	1.5	125	0.7	2.8	0.5	1.56	0.69	85	0.28	0.18

Continue of table 1.

SAMPLE	Th	Ti	Tm	Zr	W	Y	Yb	Li	Nd
AF-43	5.02	6510	0.11	104	5.8	28.4	1.7	29	8.6
AF-141	3.97	3245	0.36	0.11	14.5	11.5	0.99	29	7.56
AF-41	3.76	3575	0.19	0.17	16.3	16.3	1.3	22	10.5
AF-18	9.32	6116	0.2	8	0.7	23.2	1.4	16	33.1

SAMPLE	Th	Ti	Tm	Zr	W	Y	Yb	Li	Nd
AF-42	5.93	7043	0.2	0.1	0.7	15.3	1	8	17.4
AF-142	5.21	6685	0.36	0.68	0.6	11.3	0.65	11	12.8
AF-242	6.02	6648	0.36	0.59	0.6	11.3	0.69	11	12.6
AF-13	3.67	4698	0.41	10	0.35	19.8	1.6	8	13.6
AF-113	3.82	4939	0.29	12	0.49	26.8	2	5	17.5
AF-5	4.9	4152	0.36	0.11	0.4	13.5	1.2	11	9.5
AF-105	4.03	4461	0.24	0.22	0.5	20.9	1.7	8	13.8
AF-3	9.85	7854	0.25	8.2	0.1	32	2.5	5	54
AF-103	3.65	4802	0.1	0.31	0.6	27	2.1	5	18
AF-15	11.37	1536	0.1	0.22	0.5	20.4	1.5	2	15.1
AF-115	5.89	587	0.08	0.02	1.1	15.2	1.1	2	9

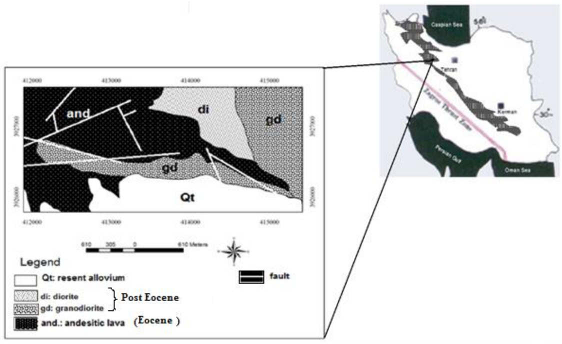

Fig. 1. Simplified geological map of 1: 25000 layout of study area and place study area in Orumiyeh-Dokhtar zone (Dorsa Pardazeh Company, 2014).

Plutonic and sub- plutonic units (di and gd)

These units have wide spread in the southwest of Saveh map but in other parts of the geological map are outcrops only in the North West with granodiorite to diorite compositions. These outcrops placed in the North-East part of the study area. These rocks have higher rates of joint and fracture systems and are lighter color than the volcanic rocks and have a more elevated morphology (Fig. 2). These unites are most granodiorite in center and change to diorite in the margin. In the field observation this unit seen same lens with 25* 14 km diameters and has outcrops from older volcanic rocks.

Volcanic units

These dark units spreading in most areas of map, particularly in West and Central with low morphology. These rocks are visible in North West of study area with different composition to andesitic and pyroclastic tuffs (Fig. 1).

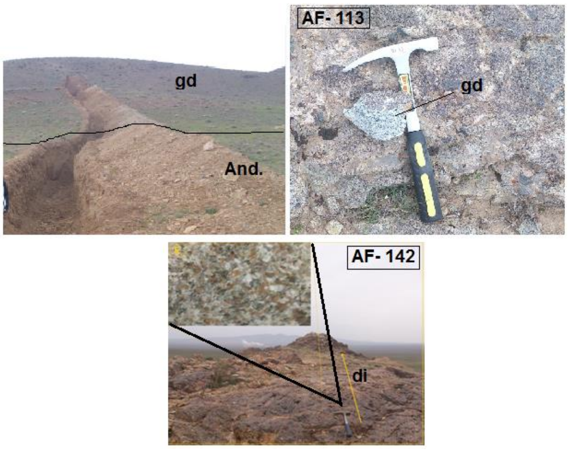

Fig. 2. Out crop of granodiorite to diorite plutonic rocks in study area.

Plutonic rocks

Plutonic rocks in the Aftabrou area are Granodiorite to diorite. In the hand samples granodiorites have light gray color with granular texture and includes pink grain feldspar, white quartz and dark hornblendes (Fig. 2). In the Microscopic studies have granular and sometimes poikilitic texture and contains of minerals such as plagioclase, alkali feldspar, amphibole and quartz. Plagioclases (oligoclase) are euhedral to subhedral shapes and sometimes developed to sericite (Fig. 3). Near the contact with andesite basaltic host rock intensity of alteration are higher than other place. Quartz is observed anhedral among the other minerals. Sometimes can be seen inclusions of needle hornblende, needle apatite and zircon in plagioclases (Fig. 3- b). Diorite in the north and North East of study area are near granodiorite unit. These rocks in hand samples are bright pink color and have dark hornblende grains and granular texture is eligible. In microscopic studies include minerals such as plagioclase, hornblende and low quartz. Plagioclases (andesine) are euhedral to subhedral shapes and sometimes developed to sericite. Amphibole is type of green hornblende and has euhedral to subhedral shapes. Magnetite is anhedral and secondary opac mineral that has been created as a result of alteration around the hornblende (Fig. 3- d). In some diorites graphic texture are visible (Fig. 3- c).

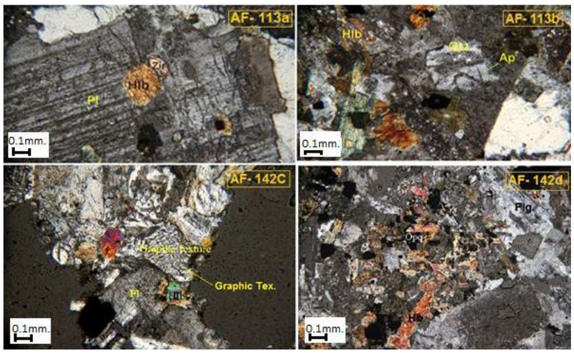

Fig. 3. Photmicrographs of granodiorite sample AF- 113, diorite sample AF- 142, Aftabrou area AF- 113a, zircon and hornblende crystals with poikilitic texture surrounded by plagioclase crystal (X20 magnification in XPL light), AF- 113b: long thin apatite needles are surrounded by quartz crystals (X20 magnification in XPL light), AF- 142c: granophyric texture in diorite rocks (X20 magnification in XPL light), AF- 142d: view of plagioclase and hornblende crystals, primary and secondary opac minerals in diorite rocks (X10 magnification in XPL light).

Semi- plutonic rocks

Semi- plutonic rocks are included diorite in study area. In hand samples are bright pink color, have a dark hornblende grains and have a fine-grained texture. Microscopic studies include minerals such as plagioclase, hornblende, clinopyroxene and opac minerals. Plagioclase is euhedral to subhedral shapes and sometimes be observed albite macles. It has a rounded edge and screening texture that sometimes developed to calcite, epidote and sericite (Fig. 4). Hornblende is euhedral to subhedral shapes and sometimes has Karlsbad macles. Clinopyroxene tends to form euhedral to subhedral crystals and consist of ring macles. Some times clinopyroxene altered to chlorite and it remains only the format of it (Fig. 4). In some had samples of diorite, opac minerals are visible large and euhedral shapes.

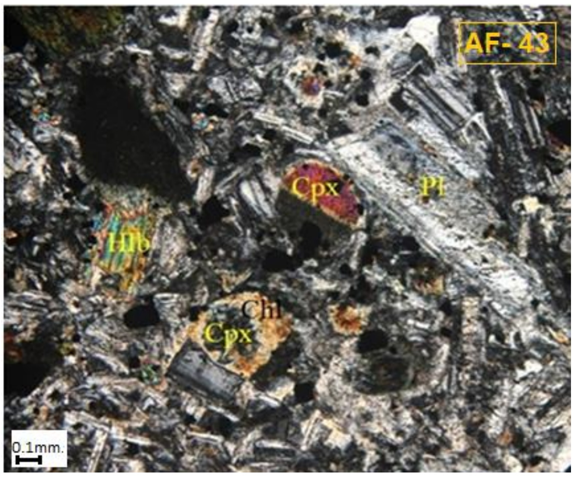

Fig. 4. Photmicrographs of AF- 43 sample from sub plutonic rocks in study area, plagioclase has poikilitic texture with fresh and altered clinopyroxene crystals, clinopyroxene sometimes altered to chlorite and hornblende (X10 magnification in XPL light).

Geochemistry

For geochemistry study, we select 15 samples including 13 plutonic samples and 2 sub plutonic and send for ICPMS and XRF analysis to Zarazma companies. The result of these analysis draw with excel and GCDkit software. In all diagrams used symbol for plutonic and symbol for sub plutonic rocks.

Geochemical Classification and Petrogenesis of plutonic and sub plutonic rocks in the study area

For naming and classification of plutonic and sub plutonic rocks have used TAS graph (Le Bas *et al.* 1979). According to this graph, the rocks place in diorites and granodiorite groups. The origin of plutonic rocks are alkaline and tholeiite series (Fig. 5) and in AFM graph show calc-alkaline origin (Fig. 6). Magma in saturation of aluminum graph (A/ NK by A/ CNK) plotted in metaluminous place (Fig. 7) but sub plutonic rocks plotted in alkaline place.

Tectonic setting

Tectonic setting for plutonic and sub plutonic rocks in the Rb by (Y+ Nb), Nb by Y, Rb by (Ta+ Yb) and Ta by Yb graphs plotted in VAG place (Pierce *et al.*, 1984).

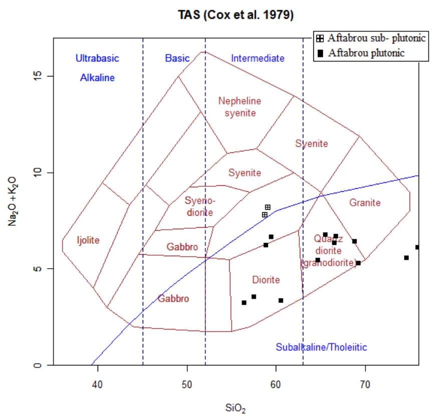

Fig. 5. The status of plutonic and sub plutonic samples in the graphs of TAS (Cox *et al.* 1979).

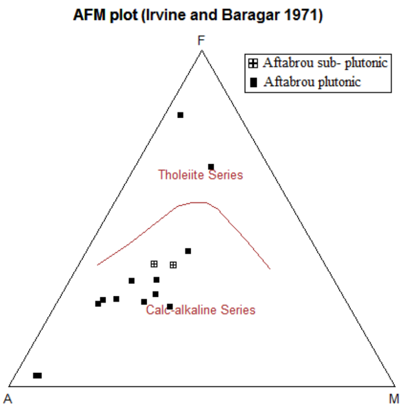

Fig. 6. The status of plutonic and sub plutonic samples in AFM graph, for separation calc alkaline and tholeiite series (Irvine and Baragar, 1971).

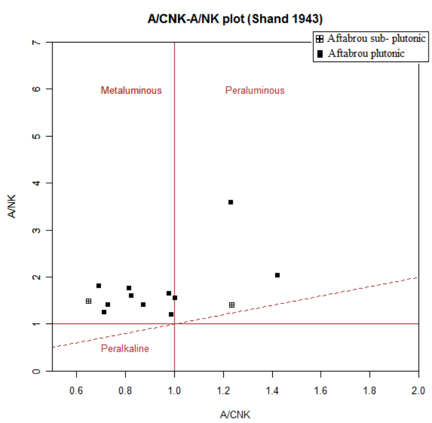

Fig. 7. Al-saturation plot for granites (Shand, 1943).

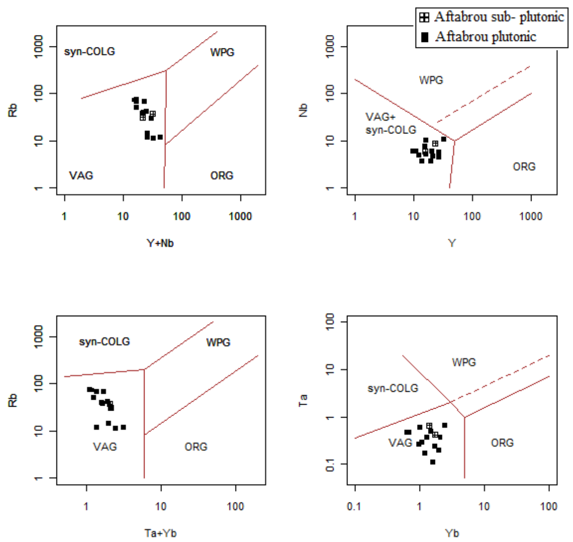

Fig. 8. Chart separation tectonic environment for granitoid and position of plutonic and sub plutonic samples in it (Pierce *et al.*, 1984).

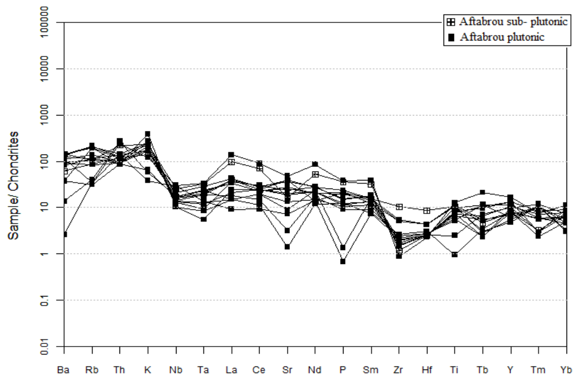

Fig. 9. The graph of changes in REE elements of normalized plutonic and sub plutonic samples than Chonderite (Thampson, 1982).

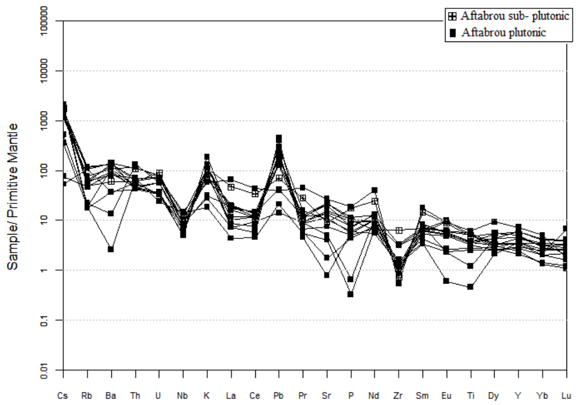

Fig. 10. The spider graphs of normalized plutonic and sub plutonic samples with primary mantle (Sun & McDonough, 1989).

Dual entity alkaline- calcalkaline origin for plutonic rocks in the Aftabrou area

Variety categories have provided for granites (Chappel & White 1974 Castro *et al.* 1991, Chappel & White 2001), but best of them is Chapel and White classified (1974, 1992). According to this classification plutonic rocks in study area with the following qualities are in I type granitoid group. Composition of these rocks is variable between Granodiorite to diorite. In these rocks amphibole is significant and accompanied by Sphene. The degree of saturation of aluminum, samples has metaluminous to peraluminous types (Fig. 7). Comparison plutonic and sub plutonic sample in this study versus Pearce *et al.* graphs (1984) show that samples placed in the volcanic arc granitoid category (VAG) (Fig. 8). Plutonic and sub plutonic samples in spider diagrams show enriched LILE elements such as U, Rb, K, Cs of than the HFSE elements such as Nb and Ti (Fig. 9). These patterns are indicating volcanic arc tectonomagmatic environment (Floyd & Winchester, 1975, Ayati *et al.* 2012, Asrat *et al.* 2003). Trace elements (including REE) changes in plutonic and sub plutonic rocks that normalized than primitive mantle data (Fig. 10) showed negative anomaly of Ti, Sr, Zr and P and enriched LIL elements (Th, K, Rb) and LREE (Nd, Ce, La) than HFSE elements (Zr, Hf, Ta, Nb, Yb, Y). This property is special for continental arc granitoides (Wilson, 1989). Magmatic formation with above properties in Convergent environment attributed in two final processes: In continental arc, primitive mantle melts that previously enriched with fluid or molten from plate subducting, combination during the climb with crust and can be caused magma parent for granitoid rocks. In other words, AFC process occurs with continental crust material during magma ascent (De Paolo, 1981). In after or same time of collision, the molten occurs with crustal source by reducing the pressure and breaks the mantle lithosphere (Robert & Clemens, 1993, Aghazadeh & Castro, 2011) and able to created felsic magma.

The first model suggests that the origin of felsic magma is basaltic magmas that originated through the fractional crystallization process. This model is known AFC (De Paolo, 1981). Low concentration of transition elements such as V (16- 145ppm) Ni (12-24), Cr (3- 20ppm) suggest magma origin in plutonic and sub plutonic rocks are according to AFC model. Which means magmatic differentiation is impossible from mafic basaltic magma from the mantle and we must look for sources of magmatic with crustal origin. At the result first model is rejected.

One of the geochemical characteristics of the middle and lower crustal melt is Low frequency of P, Sr, Ti elements (Harris *et al*, 1990; Chappell & White, 1992). In addition to plutonic rocks have positive anomalies from K, Rb, Ba, Th, La, U elements and negative anomalies from Eu (Fig. 9 and 10). These properties have inter-continental origin. As a result, felsic magma comes from partial melting from crustal protolith. These protolithses may be is meta graywacke (Wolf & Wyllie, 1994; Thompson, 1996). The presence and placement of mantle melting in crust occur partial melting, make felsic magma and climbing above classes. On the way it receives to ground, occur magma crystallization and make plutonic granodiorite.

The origin of alkaline magma makes sub plutonic rocks. These are near the plutonic rocks and can be explain with model of Castro & Aghazadeh (2011, 2013) that approved by people like Gerya & Yuen (2003); Hacker *et al.* (2011); Castro & Gerya (2008); Currie rt al. (2007) and Hall & Kincaid (2001). So that in subduction zone, reduce pressure and subducted fracture wedge cause to go out asthenosphere melt near the rift and make alkaline magma near the alkaline magma.

Conclusion

According to field study, mineralogy and geochemistry properties plutonic rocks are granodiorite to diorite and sub plutonic rocks are diorite types in Aftabrou areaand in the western part of Orumiyeh-Dokhtar zone. In same time or after the collision, the molten rock occurs with crust source by reducing the pressure and breaks the mantle lithosphere and able to created felsic magma. The first model suggests that the origin of felsic magma is basaltic magmas that originated through the fractional crystallization process. This model is known AFC. Low concentration of transition elements such as V (16- 145ppm) Ni (12- 24), Cr (3- 20ppm) suggests that magma origin in plutonic and sub plutonic rocks are according to AFC model. Which means magmatic differentiation from mafic basaltic magma from the mantle is impossible and we must look for sources of magmatic with crustal origin. The first model is rejected. One of the geochemical characteristics of the middle and lower crustal melt is Low frequency of P, Sr, Ti elements, In addition to plutonic rocks have positive anomalies from K, Rb, Ba, Th, La, U elements and negative anomalies from Eu. These properties have an inter-continental origin. As a result, felsic magma comes from partial melting of crustal protolith. These protolithses may be meta graywacke that the presence and placement of mantle melting in crust, partial melting occurred and felsic magma occur and climbing above classes. On the way that receives to ground magma crystallized and built intrusive granodiorite. The origin of alkaline magma that makes sub plutonic rocks and are near the plutonic rocks in subduction zone, reduce pressure and subducted fracture wedge cause to go out asthenosphere melt near the trench and make alkaline magma near the calkalkaline magma.

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