

(Bimodal)

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**The Petrology of Bimodal Magmatism in Diapires of Desu  
Formation in Horjand Area(N-NE of Kerman)**

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### Abstract

The petrology of bimodal magmatism of Desu series in Horjand area, a rather disordered diapir like complexes of Desu sedimentary-igneous series (Early Cambrian) can be found. In the field studies, it was found that the igneous rocks of the series are mostly basic and felsic lavas which are accompanied by small intrusive bodies. In this area, bimodal magmatism happened. These igneous rocks are in two basic and acidic families and have no intermediate components. The basic rocks are mostly basalts with some microgabbro and monzo-gabbro which are in fact intrusive category of basalt. Acidic rocks are mostly trachytes and trachylatites with some microsyenites. The additive natural trend of major, minor and trace elements phases in melt shows not only the genetical relationship between these two categories but also a compositional gap between them. The geochemical-petrological discrimination diagrams show a transitionally-alkaline or transalkali parent magma for the complex.

**Key words:** Bimodal magmatism, Daly gap, Cambrian, Salt dome, Kerman, Horjand

(Peng & Wang 1988)

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H<sub>4</sub>, H<sub>3</sub>, H<sub>2</sub>,

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H<sub>1</sub>

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(Zharkov, 1984)

57° 15', 57°00

33° 33', 30° 35'

... (Bimodal)

PW2400-PHILIPS (Diffractometer Huchriede ) .( )

– (et al, 1926

X-Ray ) XRF

PW2400-PHILIPS (Flourecance

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(Wessel, 1986)

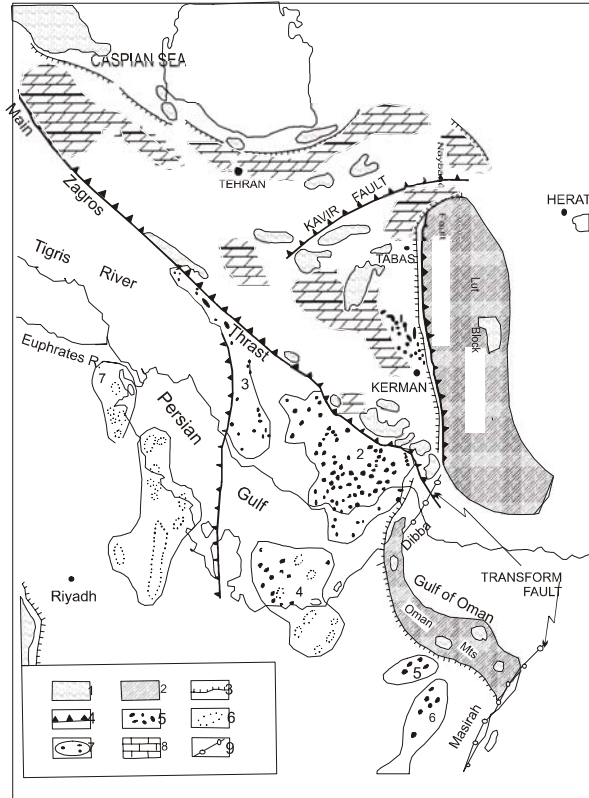
XRF

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(BH<sub>2</sub> )

X-Ray ) XRD

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- 1 . Rhine graben
  - 2 . Viking graben
  - 3 . Rio Grande rift
  - 4 . East African rift system

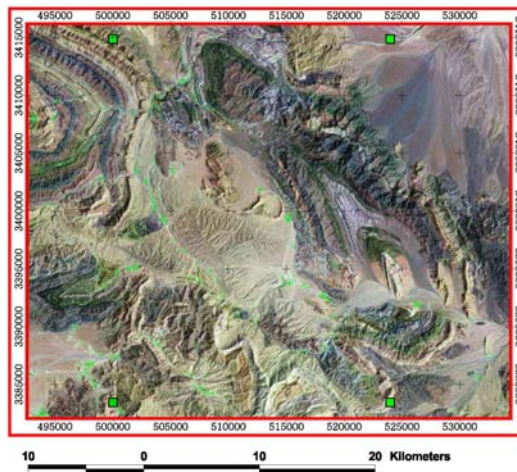


شرح علائم: ۱- مناطق فاقد قشر رسوبی، ۲- بلندی‌های عمان و لوت که احتمالاً در دوران دوم شکل گرفته اند، ۳-مرز حوضه، ۴- گسله‌های اصلی، ۵- گنبد‌های نمکی کمپلکس هرمز، ۶-طاقندیس‌های نمکی مدفون (تذکر آنکه زمین شناسان شرکت نفت آرامکو میدان قرار را به عنوان طاقندیس نمکی پذیرفته اند، Klemrae, 1984)، ۷- مناطق نمکی و عدد میانی شماره ناحیه است، ۸- رخنمون‌های دولومیت، ۹- گسله ترانسفورم. شماره مناطق: ۱- شمال کرمان، ۲- هرمز، ۳- شیراز، ۴- جنوب خلیج فارس، ۵- قهود، ۶- جنوب عمان ظفار، ۷- عربستان، ۸- کویت.

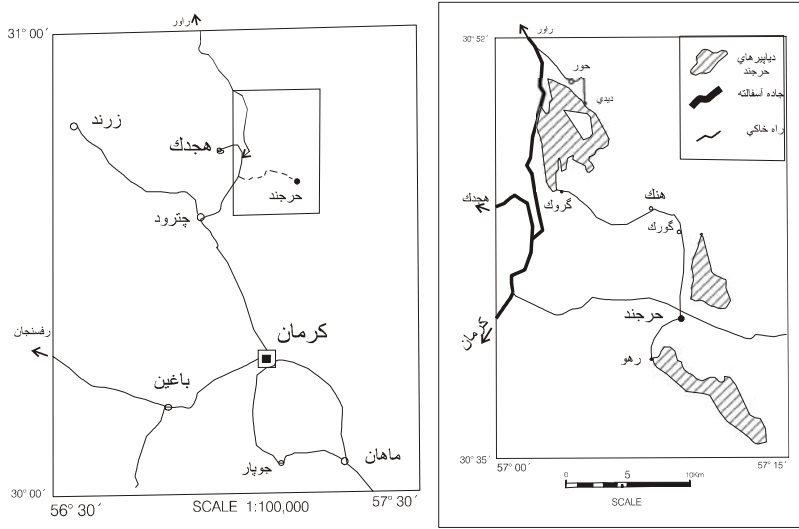
(Zharkov, 1984)

(Murriss, 1980)

(Stocklin, 1968, 1974)



... (Bimodal)



Arcview

New pet , Minpet

- 1 . Flow Foliation
- 2 . Flow Folding

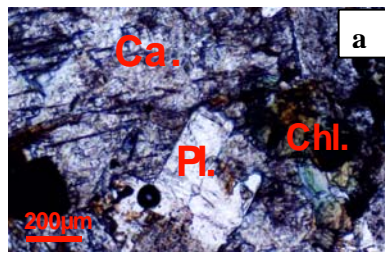
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	1-2	1-9	1-54	1-5	1-18	1-33	1-34	1-40	1-53	1-32	1-B	1-C	1-57	1-36	3-11
SiO2	50.32	50.01	47.67	47.55	49.49	50.67	48.03	47.52	48.67	47.32	48.78	48.85	47.78	46.2	43.74
TiO2	2%	1.84	2.44	1.22	1.49	1.71	1.59	1.58	2.22	2.5	2.56	1.44	1.72	1.8	3.02
Al2O3	14.3	13.24	15.37	14.92	15.98	17.29	15.03	15.56	14.05	6.06	15.49	11.18	14.03	14.36	15.95
Fe2O3	4.26	3	0.99	5.89	3.42	3.18	3.99	4.09	2.42	3.19	1.67	4.21	4.27	4.9	4.76
FeO	6.93	10.77	9.18	8.38	9.98	8.62	7.47	7.23	7.56	8.7	9.63	8.88	8.48	9.16	9.45
MnO	0.07	0.15	0.12	0.08	0.1	0.1	0.14	0.15	0.28	0.11	0.16	0.17	0.17	0.25	0.12
MgO	11.25	9.47	8.47	11.15	9.37	5.86	9.48	7.45	5.32	6.21	7.82	10.63	9.06	7.72	5.79
CaO	5.05	6.38	5.79	1.26	3.7	2.72	7.33	8.31	10.49	5.48	5.62	8.42	5.47	5.7	9.18
Na2O	4.27	3.14	4.67	2.87	3.06	3.66	3.32	3.69	2.75	4.38	3.84	2.38	3.35	4.41	4.26
K2O	1.2	1.27	0.53	4.12	1.48	0.4	1.73	1.56	2.22	1.25	1.22	1.57	1.19	0.71	0.65
P2O5	0.19	0.32	0.52	0.26	0.28	0.41	0.14	0.19	0.45	1.03	0.54	0.35	0.49	0.33	1.16
Cr	120	255	27	900	292	85	150	146	30	5	31	500	123	100	<10
Ni	69	97	22	...	62	32	92	78	34	18	29	...	51	...	11
Rb	59	49	36	100	55	44	46	39	57	49	49	<20	43	<10	41
Ba	613	550	292	...	560	268	145	126	691	282	615	...	221	...	642
Sr	801	827	387	50	250	36	606	497	443	287	483	454	797	470	601
Ta	0.9	0.8	0.8	...	0.9	0.9	0.8	0.8	0.8	0.9	0.8	...	0.8	...	0.8
Nb	15	14	14	<20	15	15	14	14	15	15	15	16	14	...	16
Hf	5.01	5	4.9	...	5.2	5	5	4.9	5.1	5	5	...	4.8	...	4.9
Zr	229	168	138	61	283	103	279	236	193	116	146	130	156	100	63
Y	36	26	31	<15	73	6	80	68	22	5	25	...	30	...	<5
Th	5.01	5	4.9	...	5.2	5	5	4.9	5.1	5	5	...	4.8	...	4.9
La	16	15	23	...	38	26	<10	<10	49	32	39	...	<10	...	50
Ce	34	37	28	...	40	28	18	16	49	34	49	...	19	...	57
Nd	23	23	28	...	36	30	14	12	42	33	37	...	9	...	42
Sm	9.9	9.5	9.7	...	8.6	9.8	10	9	10	11	10	...	11	...	9.9
Eu	2.9	2.8	2.8	...	2.4	2.9	3	2.7	3	3.3	3.1	...	3	...	2.7
Tb	1	1	1.2	...	1	1.1	0.9	0.9	1	0.9	1.1	...	0.9	...	0.9
Yb	5.1	3.3	3.6	...	7.3	3.8	3.9	4.8	2.4	6.3	3.5	...	6.2	...	7
	2-8	3-23	1-55	3-29	3-7-2	1-56	1-46	1-58	1-1	1-21	1-31	2-1	3-1	3-10	1-25
SiO2	50.32	50.01	47.67	47.55	49.49	50.67	48.03	47.52	48.67	47.32	48.78	48.85	47.78	46.2	43.74
TiO2	2%	1.84	2.44	1.22	1.49	1.71	1.59	1.58	2.22	2.5	2.56	1.44	1.72	1.8	3.02
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Fe2O3	4.26	3	0.99	5.89	3.42	3.18	3.99	4.09	2.42	3.19	1.67	4.21	4.27	4.9	4.76
FeO	6.93	10.77	9.18	8.38	9.98	8.62	7.47	7.23	7.56	8.7	9.63	8.88	8.48	9.16	9.45
MnO	0.07	0.15	0.12	0.08	0.1	0.1	0.14	0.15	0.28	0.11	0.16	0.17	0.17	0.25	0.12
MgO	11.25	9.47	8.47	11.15	9.37	5.86	9.48	7.45	5.32	6.21	7.82	10.63	9.06	7.72	5.79
CaO	5.05	6.38	5.79	1.26	3.7	2.72	7.33	8.31	10.49	5.48	5.62	8.42	5.47	5.7	9.18
Na2O	4.27	3.14	4.67	2.87	3.06	3.66	3.32	3.69	2.75	4.38	3.84	2.38	3.35	4.41	4.26
K2O	1.2	1.27	0.53	4.12	1.48	0.4	1.73	1.56	2.22	1.25	1.22	1.57	1.19	0.71	0.65
P2O5	0.19	0.32	0.52	0.26	0.28	0.41	0.14	0.19	0.45	1.03	0.54	0.35	0.49	0.33	1.16
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Rb	59	49	36	100	55	44	46	39	57	49	49	<20	43	<10	41
Ba	613	550	292	...	560	268	145	126	691	282	615	...	221	...	642
Sr	801	827	387	50	250	36	606	497	443	287	483	454	797	470	601
Ta	0.9	0.8	0.8	...	0.9	0.9	0.8	0.8	0.8	0.9	0.8	...	0.8	...	0.8
Nb	15	14	14	<20	15	15	14	14	15	15	15	16	14	...	16
Hf	5.01	5	4.9	...	5.2	5	5	4.9	5.1	5	5	...	4.8	...	4.9
Zr	229	168	138	61	283	103	279	236	193	116	146	130	156	100	63
Y	36	26	31	<15	73	6	80	68	22	5	25	...	30	...	<5
Th	5.01	5	4.9	...	5.2	5	5	4.9	5.1	5	5	...	4.8	...	4.9
La	16	15	23	...	38	26	<10	<10	49	32	39	...	<10	...	50
Ce	34	37	28	...	40	28	18	16	49	34	49	...	19	...	57
Nd	23	23	28	...	36	30	14	12	42	33	37	...	9	...	42
Sm	9.9	9.5	9.7	...	8.6	9.8	10	9	10	11	10	...	11	...	9.9
Eu	2.9	2.8	2.8	...	2.4	2.9	3	2.7	3	3.3	3.1	...	3	...	2.7
Tb	1	1	1.2	...	1	1.1	0.9	0.9	1	0.9	1.1	...	0.9	...	0.9
Yb	5.1	3.3	3.6	...	7.3	3.8	3.9	4.8	2.4	6.3	3.5	...	6.2	...	7

... (Bimodal)



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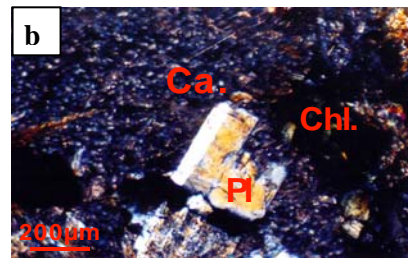
(Ch)

(Ca)

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b

a)



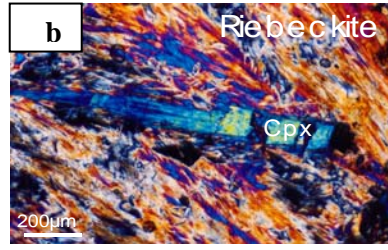
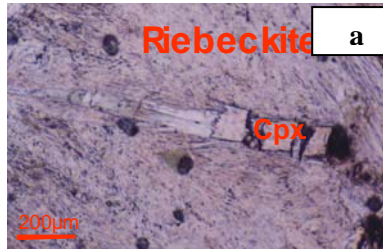
(Ab)

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( a) (Rieb) (CPx) ( b) (CPx) ( Rieb) )

%

Ca<sup>+2</sup>

CO<sub>2</sub>

Ca<sup>+2</sup>

1

( ) :

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( )

Rb/Nb+Y Zr/Y

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2

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.(Hughes, 1983)

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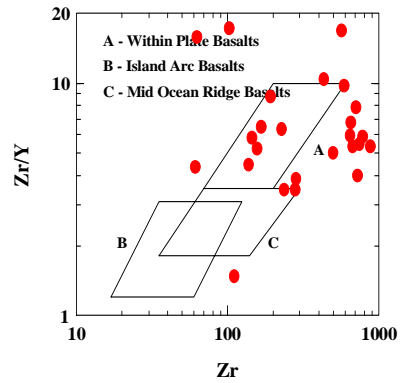
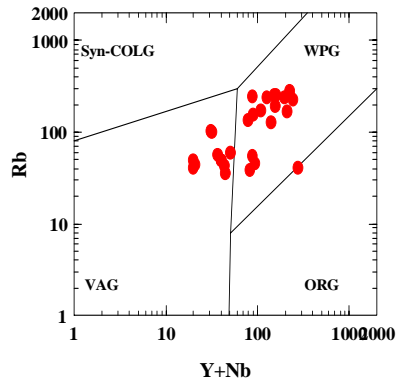
3 . immobile  
4 . within plate

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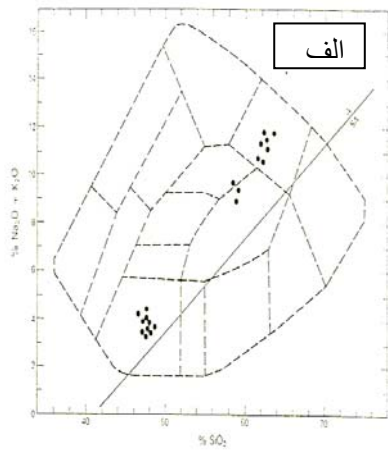
1 . late magmatic  
2 . transitional basalt



... (Bimodal)

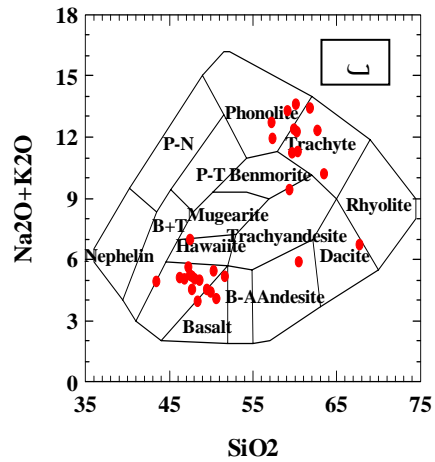


. Zr/Y Rb/Nb+Y



( ) (Wilson, 1989)

. ( )



) Gregory

( )

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( )

Hall, 1978 & )

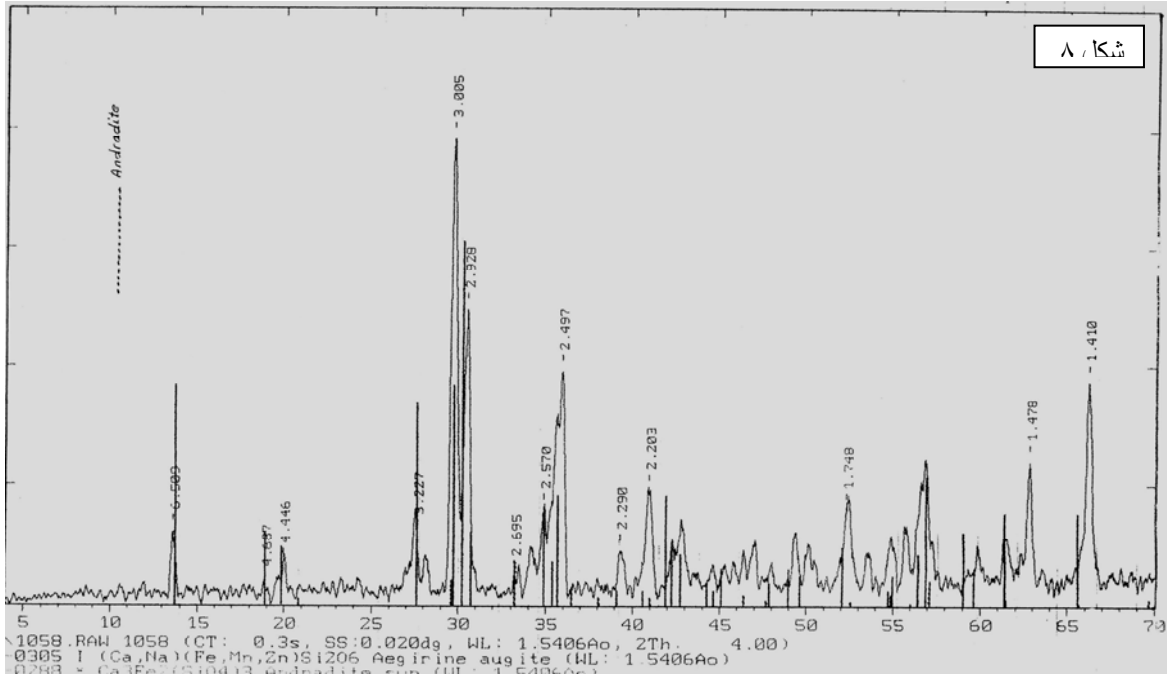
(Daly's gap)

.(Middlemost, 1987

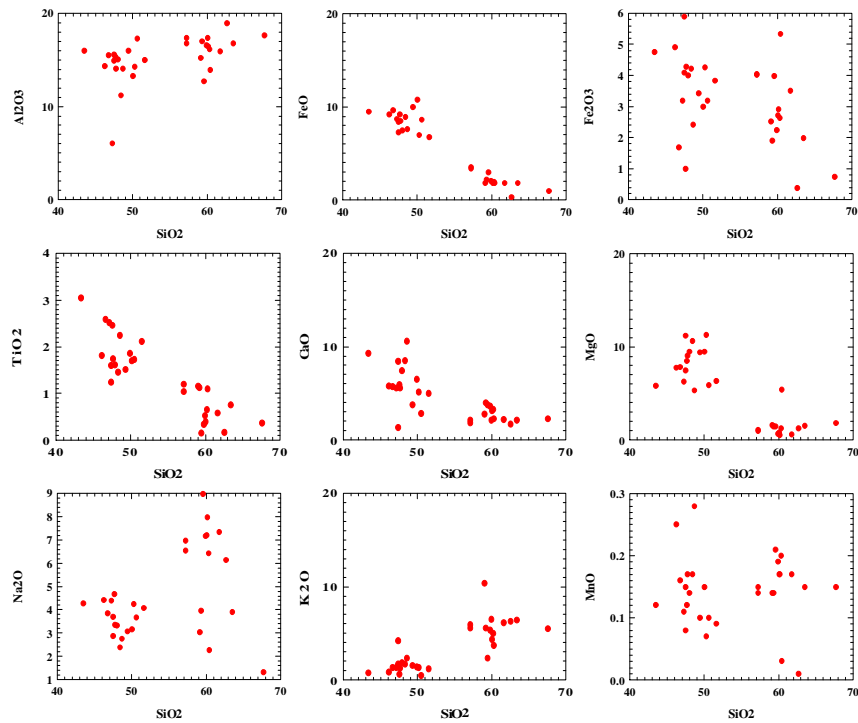
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(transalkaline)

1. compositional gap

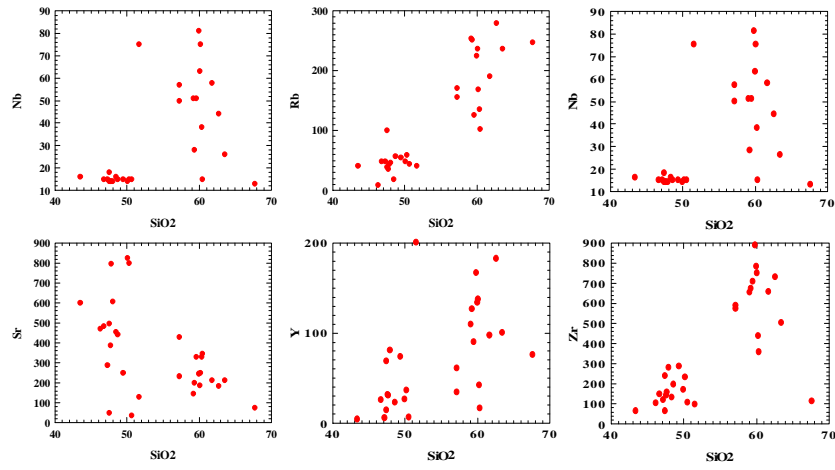


X-ray

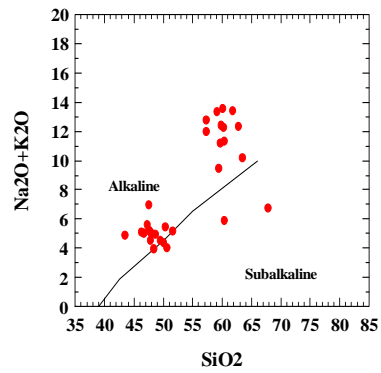


SiO2

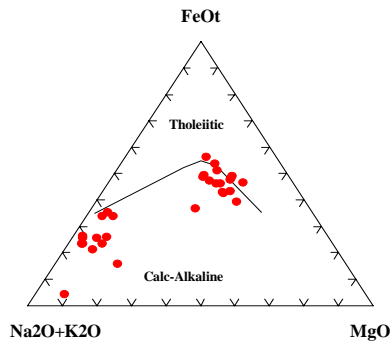
... (Bimodal)



SiO<sub>2</sub>

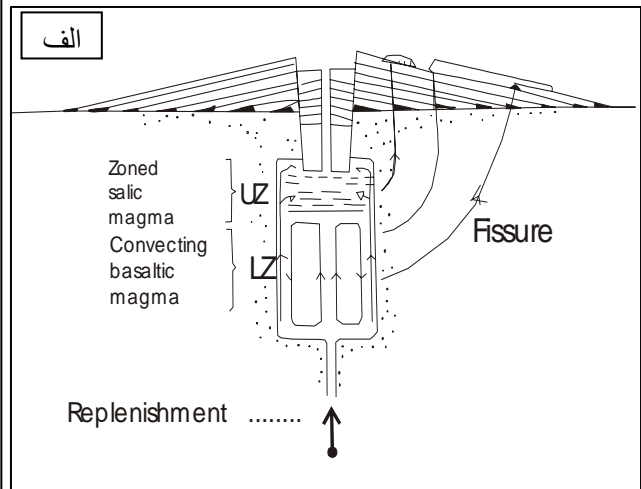
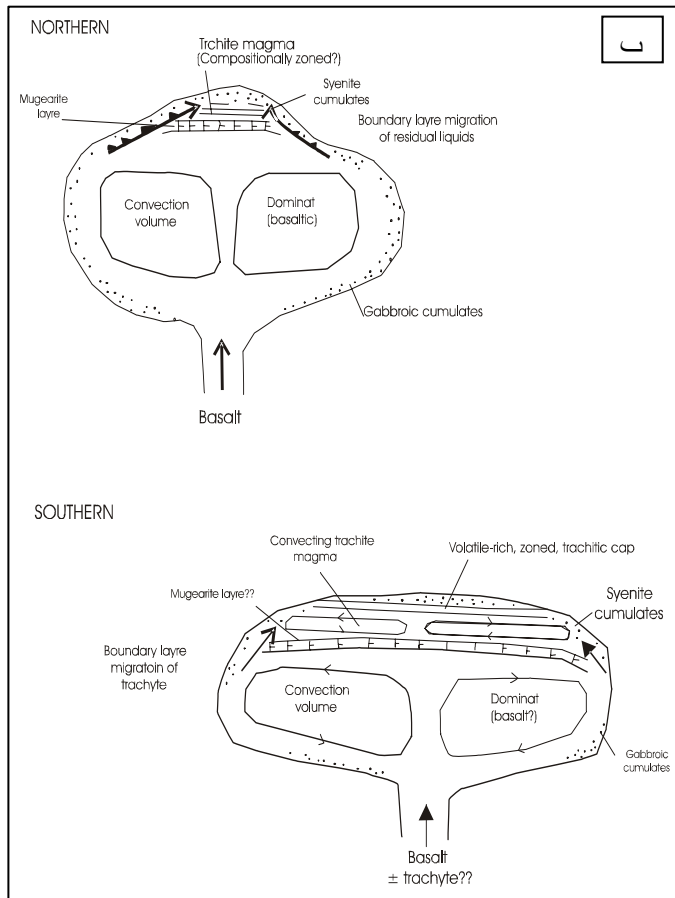


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.AFM

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(Fitton & Upton, 1987) Baker

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(Fitton & Upton, 1987)

Macdonald

( )

( )

... (Bimodal)

Na<sub>2</sub>O ,K<sub>2</sub>O ,Fe<sub>2</sub>O<sub>3</sub> ,CO<sub>3</sub>Ca

MC Briney, )

(Best, 1982)

(1984

(Middlemost, 1987)

(Middlemost, 1987)

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(

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(

( )

H<sub>2</sub>O ,CO<sub>2</sub> ,CO<sub>3</sub> ,SO<sub>4</sub> ,O<sub>2</sub> ,F ,P

SiO<sub>2</sub>

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- 1 . extensional environment
  - 2 . sorret effect
  - 3 . double diffusive convection
  - 4 . liquid immiscibility
  - 5 . gaseous transfer

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... (Bimodal)

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