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RARE EARTH ELEMENT GEOCHEMISTRY OF WITHIN PLATE GRANITE (TSAGAAN DAVAA, MODOT, BOGD UUL)

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Rare earth elements geochemistry is very important to study of rocks. In this paper we report the rare earth elements characteristics of the Bogd uul, Modot, Tsagaan Davaa granite plutons which intruded Early Mesozoic time in the Khentii uplift. The Khentii uplift of Central Mongolia which developed Mesozoic granitic magmatism is a part of the 1000 km wide Mongol Okhotsk fold belt extending from Khangai mountain in Central Mongolia up to Pacific Ocean over 3000 km (Zonenshain et al., 1976). According to the study of Kovalenko et al., (1995), Koval et al., (1998) Mesozoic magmatic events are distinguished to early Mesozoic (170-240 Ma) and Late Mesozoic (100-170 Ma) magmatic activities have been determined in Mesozoic era based on mainly K-Ar and very few Rb-Sr and U-Pb dating. In the Mesozoic time in a large territory of Central and Eastern Mongolia, the continental crust has been formed and Mesozoic magmatism developed in the mature continental crust. Mesozoic intrusive episodes were interpreted as a tectonic and magmatic activation by Nagibina (1967) and Scheglov (1968), continent-continent collision by Zonenshain et al., (1990) or plume activity by Koval (1998). Mesozoic intrusive magmatism is characterized by shallow, high evolved granitic intrusions in the most internal part of the Mongol-Okhotsk fold belt (O.Gerel et al., 2002).

Tectonically, Bogd uul granite pluton located in the Khangai-Khentii basin, Tsagaan davaa pluton located Haraa terrane, Modot pluton located in the Ereendavaa terrane according to the tectonostratigraphic terrane map (Badarch et al., 2002) but they have similar mineralization.

Bogd uul granite pluton located south of Ulaanbaatar city and situated on the western bank of the Tuul River. Geologically, it is distinguished in Khentii uplift. The Bogd uul granite pluton is oval (200 km²) in shape with its longer axis being oriented NW-SE perpendicular to the fold axes of its host rocks. Bogd uul granite pluton emplaced to the Carboniferous flysh rocks strata. On the margins of the Bogd Uul intrusion, hornfels is present in the contact aureole of the sedimentary succession. The Bogd uul pluton comprises of two facies rocks. The first facies rocks are comprises coarse-grained, porphyritic biotite granite; the second are represented by fine- to medium-grained leucogranite and granite-porphry. The margin of this massif presents a low mineral potential. Only northeastern contact was discovered anomalous value of rare metals mineralization. There appear aplite dykes trended to NW through SE and little various bodies of miarolitic pegmatite with light green amazonite in feldspar zone of pegmatite in massif. Little miarolitic pegmatites are very small and almost doesn't developed cavity.

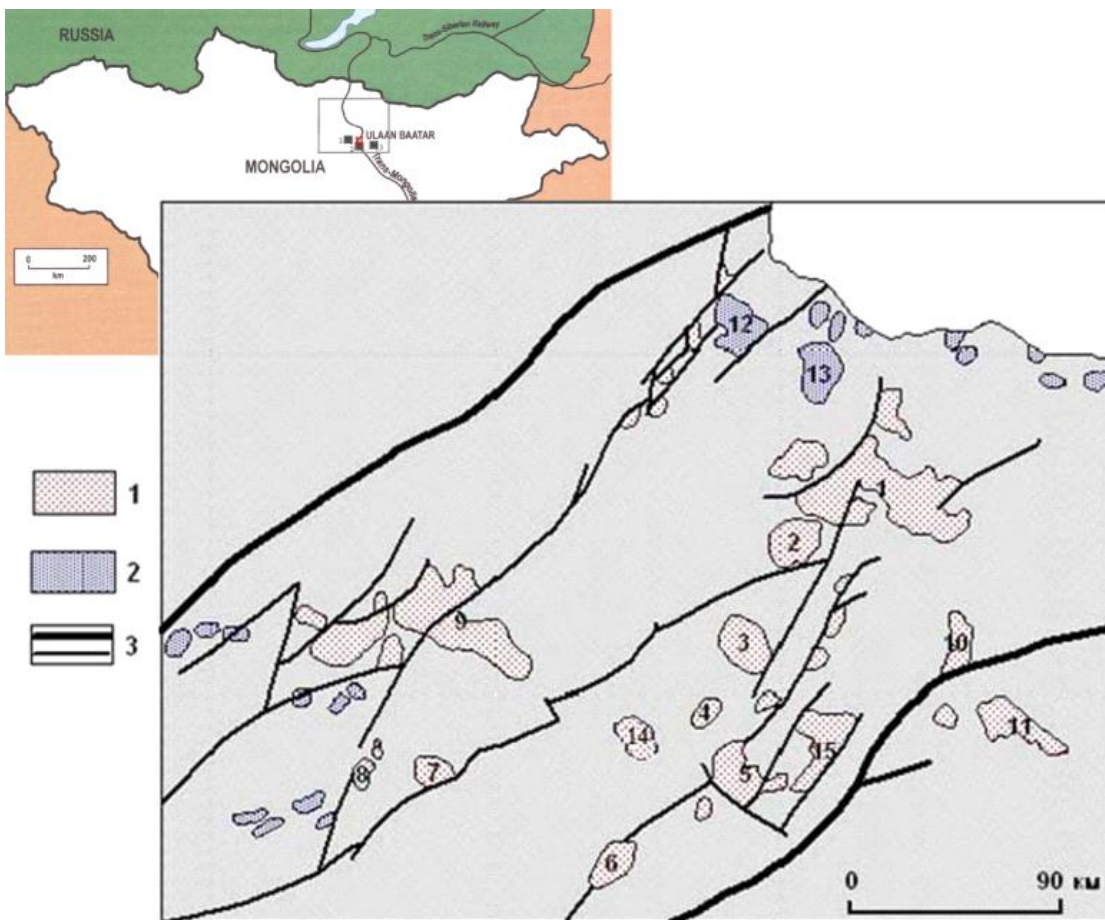


Fig 1. Mesozoic intrusions in the Khentii uplift. 1-Early Mesozoic, 2-Late Mesozoic, 3-faults; Massifs: 1-Shoroot gol, 2-Arts gol, 3-Zuun bayan, 4-Gorhi, 5-Janchivla, 6-Avdar bayan, 7-Khoshuut uul, 8-Avdar, 9-Tsagaan davaa, 11-Modot, 12-Bugant, 14-Bogd uul, 15-Bayandelger

The age of the Bogd uul granite pluton was estimated to be 154 Ma (Bobrov, 1963) and 138–154 Ma (Koval et al., 1982) using the K-Ar method, and 205.7 ± 4.1 Ma and 208.4 ± 9.1 Ma (Khishigsuren et al., 2003) by single zircon lead evaporation analyses. U–Pb isotopic analyses carried out in the geochemical institute of Tokyo, Japan were for the zircon grains from the Bogd uul granite pluton indicate Late Triassic to early Jurassic (S.khishigsuren et al., 2009).

Tsagaan davaa pluton is located 80 east of Ulaanbaatar city, on the southeast spurs of the Shireet range. It was studied in detail by Ts.Dorj, V.Khubildikov, D.Sengee, D.Byamba, Y.Kempe, P.V.Koval, B.I.Kovalenko. Tsagaan davaa pluton is intruded to the Haraa group metasedimentary rocks and consists of 3 facies granite. The first facies comprises porphyritic, coarse grained, biotite granite, second facies consists of fine- to medium-grained leucogranite, third facies represented by fine-grained leucogranite. The veins and zones consisting of tungsten, tungsten-tin and tungsten-tin-beryllium are emplaced in this third facies granite of Tsagaan davaa pluton. Radiologic age of the various type of Tsagaan davaa granite by the K-Ar methodology is 180-245 Ma, it coincides to Late Triassic to Early Jurassic (Kempe et al., 1966 and 1975).

Modot pluton is located 80 km southeast of Ulaanbaatar city and 12-17 km Tsenkhermandal sum center of the Khentii. This pluton has been studied by many scientific manuscripts of R.A.Hasin, N.A.Marinov, A.G.Glebov, A.N.Buharov, N.I.Homizur, Yu.V.Chudinov, V.I. Kovalenko, P.V.Koval, S. Dandar. Three facies granites have been described and developed in the geology and petrology of this pluton. The first facies of this pluton composed of porphyritic coarse-grained granites and granodiorite, the second facies of medium-grained biotite granite with weakly developed feldspar porphyry. V.I.Kovalenko et al., (1971) classified Modot second facies medium grained-granite into Modot type and standard granite. This granite is similar to the granite composition of earth lithosphere by the petrographical and

chemical composition. The third facies composed of microcline leucogranites. These granites have been described as rare metal granites with Li-F facies by Kovalenko et al., (1971). The greisens and metasomatite rocks with Sn-W-Mo sulfide mineralization followed by this third facies granite by the space and origin. Modot, Khujkhaan Sn-W deposits and Bayanmod cassiterite placer deposit are occurred with this pluton. The age of this massif is 199-135 Ma by the K-Ar method (Kovalenko et al., 1971).

The rare earth element analyses carried out geochemical laboratory of the Middle East technical University, Ankara Turkey by the ICP-MS analyses. Analytical data are shown in table 1.

Table 1. Data REE-s, mg/g

Фаз	Bogd uul						Modot				Tsagaan davaa					
	II			I			II	I		III	III		II		I	
№	33	2030	2034	2053	2057	2064	2	6	8	10	26	27	28	30	32	25
La	43,6	44,6	30,6	38,8	46,9	32,9	42,7	33	12,3	14,2	35,3	11,2	37,7	11,3	33	25
Ce	97	99,4	64,4	81,4	105	90,9	103	67,9	11,4	37,6	50,9	22,1	88,5	28,3	59,7	59,2
Pr	11	11,2	7,04	8,83	12	11,7	12,3	8,12	6,09	5,37	9,29	2,36	9,9	4,04	8,73	7,05
Nd	35,1	39,2	22,6	31,2	45,3	44,7	46,4	29,2	25,9	20,7	34,1	7,72	37,2	15,4	30,5	27,5
Sm	8,5	8,48	4,13	5,24	8,97	10,4	9,22	5,65	9,56	6,47	5,97	1,44	7,38	4,03	6,07	6,62
Eu		0,16	0,24	0,7	1	0,86	1,56	1,29			0,46	0,53	1,07			0,55
Gd	8,44	9,17	4,23	4,99	8,87	9,61	9,03	5	8,95	7,76	4,97		7,59	3,52	5,13	6,3
Tb	1,82	1,82	0,72	0,86	1,47	1,81	1,4	0,84	1,66	1,83	0,72	0,24	1,25	0,65	0,82	1,18
Dy	13	12,1	5,09	5,82	8,7	12,2	8,32	4,75	10,2	12,2	3,53	1,38	7,49	3,98	4,91	7,28
Y	99		109	32			40	24	43		13		46	139	31	45
Ho	2,88	2,67	1,17	1,18	1,64	2,28	1,52	0,88	1,84	2,46	0,59	0,21	1,32	0,81	0,91	1,53
Er	10	8,86	3,35	3,75	5,72	7,64	4,25	2,91	5,99	8,41	1,62	0,82	4,09	2,85	3,12	4,75
Yb	12,4	11,1	4,38	4,47	5,45	7,63	3,87	2,65	6,57	8,97	1,69		3,84	3	2,87	5,19
Lu	1,69	1,65	0,67	0,78		1,2	0,59	0,51	0,9				0,62		0,37	

In the REE variation diagram of granitoids increasing of REE content is visible for LREE while other elements (HREE) have almost similar concentration in all three granitoid massifs (Fig. 2, 3, 4). Bogd uul granitoids show that little europium minimum than the Modot and Tsagaan davaa granitoids. The La/Yb ratios are being 2.5-6.2 in the Bogd uul granitoids, 1.1-8.9 in the Modot and 2.69-14.96 in the Tsagaan davaa granitoids.

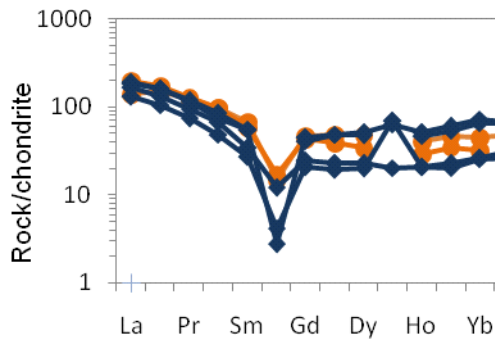


Fig. 2 Chondrite normalized REE pattern for the Bogd uul granitoids (Taylor, McLennan)

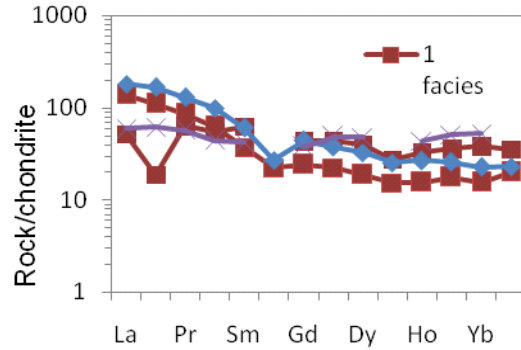


Fig. 2 Chondrite normalized REE pattern for the Modot granitoids (Taylor, McLennan)

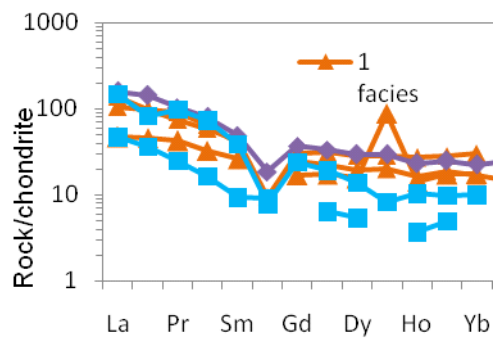


Fig. 4 Chondrite normalized REE pattern for the Tsagaan davaa granitoids (Taylor, McLennan)

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