Changes of matter phase state and mineral species of intrusive formations of Dashkesan ore area of the Lesser Caucasus.

Suleymanli R.Dj., chief geologist, (Dashkesan mountain-ore production).
Yuzbashova U.A., dissertant , (Baku State University)
E-mail: Ulyam2017@mail.ru

Long-term dynamics accompanying formation of intrusives showed that morphology of thermal field isotherms depends upon the form of initial intrusive under the conditions of isotropic host medium. Composing of vertical and horizontal thermal flows caused appearing of isotherms horizontal orientation in flat roof of massif. Conditions of stable temperatures formed in anomalous local areas and kept for a long period of time. Entirely of Earth Crust and Earth surface evolution underwent the complete rethink in mobilist terms. In this case it turned out that all processes described by plates tectonics occurred in more complicated form that it was supposed before. However, these amends untouched the main idea of this conception. Exception was magmatism occurring inside the plates which is typical for collision zone and it was considered to be inner monolithic. A noticeable leap can be observed on all these collision borders of the Lesser Caucasian in changing the velocity of seismic waves distribution (1) which shows appropriate change of matter phase state and also change of one mineral species by other species according to depth (6).

Dashkesan ore region with such major deposits as iron ore, cobalt, alunite, barite, magnesium, alunite-pyrophillite, kaolinite, secondary quarzites, mable and other ore and non-ore mineral resources plays an increasingly important role in economy of Azerbaijan Republic. Ore mining is also highly developed here. Geological structure of ore region consists of volcanogenic, volcanogenic-sedimentary, intrusive and metamorphic rocks of the Middle and the Upper Jurassic. The older rocks are of the Upper Bajocian, they form the lower part of Kamargaya mountain northern slope nearby Sharukar village, here they are overlapped by agglomerate lavas, then horizon of yellow tuff sandstones of the Lower Bathonian. Then appear tuff conglomerates, tuff breccias and tuff sandstones of the Upper Bathonian, they are covered by thin horizon of argillites and sandstones of Callovian alternating by thick horizons of Oxfordian carbonaceous rocks, higher is alunite thickness covering the yellow tuffites of Kimmeridgian.

Intrusive massives outcrops within Dashkesan ore region, they are invaded by successive stages. Each stage is connected with mineralization and possesses its own dyke series or groups of intrusive rocks. Here heterochronous dykes may have a close petrographic composition in many cases. According to it study of intrusive massives and their dyke rocks should be conducted along with detailed petrographic and geochemical research and also with thorough chrystallochemical definition of rockforming minerals of intrusive rocks and dykes in order to reconstruct the history of their formation. Intrusive formations play an essential role in geological structure of Dashkesan ore region. Here more than 60 outcrops of intrusive bodies of stock types are registered here and also strata and cross-cutting apophyse taking the area of 30 sq.km jointly with 400 dykes. It is a part of thick polyfacial and polyphase intrusive complex. Intrusives of Dashkesan region is of great interest inasmuch as mineralization of this region is genetically connected with these intrusives. Though they were thoroughly studied by many researchers at different times but at present there is no a concrete idea on some issues of this problem.

The ages was a detatable issue for a long time: K.N.Paffengoltz considered Dashkesan intrusive to be of the Upper Eocene, Sh.A.Azizbekov – the Upper Cretaceous, V.N.Kotlyar suspected Pre-Cenomanian, V.Y.Khain suggested Pre-Cenomanian-Post-Upper Jurassic. R.N.Abdullayev, G.I.Kerimov and M.A.Gashkai referred intrusive to the Lower Cretaceous (1,4). This conclusion can be linked with M.A.Gashkai's data of absolute age. Definition of aplite age

from Dashkesan intrusive taken from Bayansar area shows this age is within interval 100-150 mln. yrs and this corresponds to the Lower Cretaceous. Represented data allows to presume the Lower Cretaceous age of Dashkesan intrusive complex (4). This complex intrusive cuts all complex of Middle and Upper Jurassic rocks. For a long time all researchers considered this intrusive to be paleofacial but monophasic. For the first time K.N.Pafengoltz considered mapped area to be monophasic intrusive. The same idea belongs to Sh.A.Azizbekov and D.M.Akhmedov (1). However, according to M.A.Qashkai's observations (4) intrusive is polyfacial and polyphasic as well, and eruption of Dashkesan intrusive occurred from the same magmatic focus during Neocomian folded movements which caused four phases of intrusion: I phase-gabbroids, II phase-granitoids, III phase-granoaplites and IV phase-diabases (dykes).

First phase of intrusive activity is characterized by intrusion of main composition magma. Some intrusive massives of the first phase are found in area of vil. Kazakholchular mountain Pirsultan, vil.Rudnik and in other places. Morphologically they are cross-cutting bodies of stock types accompanying by apophyses of the same composition with not large area up to several hundred of square metres. The main mass of intruded material is located in the central part of area where intrusive remnants dissected by the late intrusions remained as some massives in valley of Koshkarchai river (nearby vil. Rudnik and in valley of Mollagasanlysu brook). The rocks of the first phase are represented by gabbro, orthoclase gabbrodiorites, quartz-orthoclase gabbro-norites, gabbro-syenites, augite-diopside diorites, etc. Hornblend-pyroxene quartz containing syenite-diorites and pyroxene-hornblend adamellite are found in some parts of intrusive of Pirsultan mountain. But generally these rocks are not typical for the first phase of intrusion.

Intrusion of the second phase intrusion according to facial composition and to morphology is more complicated. Magma composition is medium acid. Besides the major intrusive which takes more than 25 sq.km there are a lot of apophyses outcropped in area with several square metres up to several thousand square metres. Rocks composition of all outcrops vary within a wide range from adamellites to gabbro, gabbro-norites and gabbro-diabases. In this case the main mass of rocks is represented by adamellites, granodiorites, banatites, diorite-syenites and syenite-diorites, and in marginal parts of the main intrusive, in endocontacts and apophyses prevail medium and the main differences such as: syenite-diorites, diorites, gabbro-diorites, gabbro-diorites, gabbro-norites and gabbro. They outcrop in area nearby vil. Mollagasanly, mountain Ziyaratdag and mountain Pirsultan. The features of hybrid origin are typical for the rocks of the second phase intrusion. Rocks diversity is much more than in rocks of the first phase, and this is connected with high assimilation capability of magma providing the second phase intrusion and due to wide range of magma by volatile components.

Relationship between rocks of the first and second phases of intrusive can be easily established. Moreover, well-defined boundary of intrusive is observed between rocks of the first and second phases in some areas, for example village Mollagasanly and towards north of last village's cemetery apophyses of second phase intrusive are found and here gabbroids of the first phase are host rocks for them. Moreover, in near-contact area of second phase intrusive xenoliths gabbro of the first phase are found. All these facts undoubtedly prove that second phase intrusive formed when intrusive of the first phase had already consolidated. However, similarity of rocks of the first and second intrusion, availability of transition between them and similar hybrid differences and also a big likeness of rocks on microelements composition allow to consider that these intrusions are represented by independent phases of intrusions, but due to closeness of time the process of magma differentiation wasn't able to differentiate rocks composition. Probably it's more accurate to talk about subphases but not phases.

The third phase of intrusion in Dashkesan intrusive complex can be vividly observed and magma intrusion is characterized by more acid composition. The rocks are represented by vein leucocratic differences: plagioclasites, diorite-aplites, syenite-aplites, granite-aplites, aplites and plagioaplites. Body consists of usual small veins and veinlets of irregular shape, injections as fissure intrusions with thickness tens of meters and extension more than one kilometer. Morphologically more complicated bodies are also found, but a general configuration of the latter and correlation with host rocks point out that chambers with magma of third phase intrusion are of fracture pattern. The smaller ones among these intrusive – veinlets and small veins are mainly distributed in rocks of the first and second phases. They are commonly found. The larger bodies lean towards area nearby village Mollagasanly and towards east. Here several larger bodies and a great amount of small granoaplite veins can be observed in creek valley and on watershed with ravine Bayansary. It is characteristic that intrusion of the third phase, except for insignificant number of small veinlets, nowhere goes beyond rocks development of the first and second phases. Scarnification is observed on joints in rocks of the second and third phases. Dykes belonging to the fourth phase of intrusion have a wider areal extent. About 400 dykes with extension 1,5-2,0 km are observed in area. Most of dykes are represented by rocks of the main composition – diabases and diabase porphyrites. Sulphoarsenide mineralization of cobalt is genetically connected with them. Here are dykes of gabbro-porphyrites, andesite porphyrites diorite porphyrites.

Extention of dykes is different but four directions prevail: NE 30-40°, NE 70-80°, NW 275-295°, NW 310-320°. Typical hydrothermal changes are observed in near-by selvages parts of dykes. Scarn and postscarn processes also appear in contacts by forming of garnet, epidote and other minerals. Most of dykes are represented by rocks of the main composition and only some ones by quartz-containing differences. Changes of composition are found in some dykes on vertical, in more hypsometric high parts they consist of rocks of middle and even acid composition but in deep erosion strippings – there are diabases and gabbro-porphyrites. This case doesn't permit to determine dykes according to rocks composition. All these rocks of dykes more or less are metamorphized – hornfelsed, epidotized, chloritized, sometimes – skarnificated and even substituted by magnetites. The recent fact defining age relationship between dykes and hydrothermal mineralization is of great interest. Age correlation between dykes and intrusions of the first and second phases defines easily. In area of mountain Pirsultan and village Kazakhyolchular dykes cross the rocks of the first phase. In area of village Mollagasanly dykes cross rocks of the first phase and transfer to rocks of the second phase. Therefore, dykes are not older than second phase.

To define age relationship between third phase rocks and dykes is not easy at all. According to field observations it has been found that only in one place-ravine at distance of 1 km towards NE of village edge Akhmadly dyke of aplite is cut by dyke of diabase. All dykes are just of the same-age formations. Among them are intercross dykes represented by conjugated fractures filled with rocks of one injection and also cross ones when one dyke "cuts" the other with contact effect and is younger in comparison with it. However, it is not a ground for separation dyke complex into several independent phases (7). It only shows that tectonic movements caused formation of wiggle joints and magma injection had a pulsing nature, whereas tectonic regime remained stable during all process of fissure intrusions formations. Taking into account the movement of magma flow formation of ore-forming porphyry intrusions of final phase occurred against the background of uplift of large rocks blocks, host granitoid plutons and was accompanied by their erosion. Transportation of melting to hypabyssal zone carried out on

magmatic waters – fracture channels of different origin. Calculations of melting movement in channel taking into account magma crystallization on channel walls and reduction of carrying capacity show how hypabyssal body with volume of hundreds cubic kilometers could be formed from transported magma. Magma transition to the Upper horizons of crust and in this case unavoidable partial crystallization of meltings as a result of cooling and loss of fluids provide development of drain structures. Zone of deep fluid subflow formed on the base of hypabyssal intrusive. As a result of it magmatogene hydrothermal system formed which developed during melting crystallization. This predetermined significantly the place of ore cluster formation and loss of hydrothermal flow not less than 10.7 g/sm^2 which was necessary for formation of industrial concentrations of large iron-ore metals of Dashkesan type. Therefore, among dykes of fourth phase intrusion are different age formations though they formed in one phase of intrusion equivalent to other phases of complex Dashkesan intrusive. Facial transitions can be observed within all phase formations and also proper veins and apophyses. Under influence of this complex intrusive on host rocks of Dashkesan ore region the following deposits formed: contact-metasomatic skarn-magnetite deposits, hydrothermal cobalt, hydrothermal-metasomatic alunite and pyrophyllite deposits.

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