CHARACTERISTICS OF THE RADIOAKTIVE RADIATION FIELD IN THE ANGREN-ALMALYK ORE DISTRICT

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ABSTRACT

This article presents the results of studies using the airborne gamma spectrometric method of the Angren-Almalyk ore region in order to identify radio geochemical specialized (RGS) zones where concentrations of U, Th, K40, which are anomalous relative to the average content, are observed, which may be evidence of the content of certain species in these zones minerals. Field anomalies can be either abnormally high values of its components, or such changes in the relationships between them that are unlikely for background variations of these components (or both). Naturally, the second option is of greatest interest, since the method of identifying promising anomalies based on it turns out to be similar to the method used in geochemical prospecting, when prospectivity is established by breaking the background correlation between the observed elements with the identification of the dominant one.

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KEY WORDS

radioactive radiation field, average content of uranium, thorium, potassium isotope, identification of promising anomalies, radiogeochemical specialized zones, lithophile, chalcophile ore objects..

Introduction

The Chatkal-Kurama region, covering the Karkantau, Ugam, Pskem, Chatkal, Kurama ridges, is widely known as the Middle Tien Shan, most of its territory is composed of Paleozoic igneous rocks.

The geological and economic significance of this territory is very important, since the operating large mining enterprises of Eastern Uzbekistan are located here, which determine the overall industrial potential of the republic.

The study of the geological structure of the territory in connection with the nature of the distribution of various physical fields has important theoretical and practical significance for identifying new deposits and for expanding the prospects of existing enterprises.

The Chatkal-Kurama region at different periods of time has been quite fully explored by aerial methods at various survey scales (1:10000, 1:25000, 1:200000) using various equipment (AGSM-25, AEM-49, AGS-71, AGS-8km and etc.).

The research area is located in Eastern Uzbekistan and includes almost the entire system of the Chatkal-Kurama Mountains, which are highlands with a general northeastern trend of mountain ranges with heights ranging from a few hundred to several thousand meters with a very diverse topography. Mountain structures are separated by narrow conion-shaped incisions of the rivers Ugam, Chatkal, Angren, Aksu and smaller rivers.

Complex airborne geophysical studies were carried out within the Gava-Chadak ore field using an MM-305 aerial magnetometer and an AGS-8km aerial gamma spectrometer with recording on magnetic tape and subsequent computer processing and interpretation of the obtained materials.

As a result of the work, promising areas were identified, which were subsequently transferred to geological and geophysical expeditions for prospecting and exploration work. These works served as the basis for further airborne geophysical research in the period 1991-1995. at the western end of the Chatkal-Kurama region using the MMV-215 aerial magnetometer and the AGS-8km aerial gamma spectrometer with satellite reference of routes using the A-724 product.

Maps of the contents of uranium, thorium and potassium were compiled using a computer in the automated “Target Forecast” system. A comprehensive interpretation of airborne geophysical and ground-based geological and geophysical materials was carried out and the promising areas of Western Aigyrbaital and Karabash depression were identified.

Research Methods and the Received Results

The airborne gamma spectrometric method (AGSM method) successfully solves some important geological prospecting problems such as searching and detecting metasomatic changes in zones and ore bodies, the formation of which was accompanied by the accumulation and

redistribution of the main natural gamma radiation - thorium, uranium, potassium.

The results of AGSM measurements are extensive and not intensive quantities, that is, the measurement result is a function of the product of the mass of gamma radiation affecting the detector and their concentrations, that is, the configuration of the structures of the components of the earth's radioactive radiation field - thorium, potassium, uranium, obtained as a result of AGSM survey , is very random, as a result, the results of AGSM measurements cannot be considered adequate to the specific geological situation of the area reflected on the geological map.

Therefore, the main value of AGSM data is manifested not in the ruggedness of the field, but, mainly, in the induction of a radio geochemically anomalous situation, expressed in anomalies in the content of radioactive elements (RAE).

Taking into account the above, field anomalies can be either abnormally high values of its components, or such changes in the relationships between them that are unlikely for background variations of these components (or both).

Naturally, the second option is of greatest interest, since the method of identifying promising anomalies based on it turns out to be similar to the method used in geochemical prospecting, when prospectivity is established by breaking the background correlation between the observed elements with the identification of the dominant one.

The radioactive radiation field in the study area is extremely heterogeneous. In general, the described area is characterized by an increased background for all components of the radioactive radiation field, equal for uranium - (3 - 5) * 10-4%, for thorium - (12 - 26) * 10-4%, for potassium 3 - 6%, then there are more than two clarks.

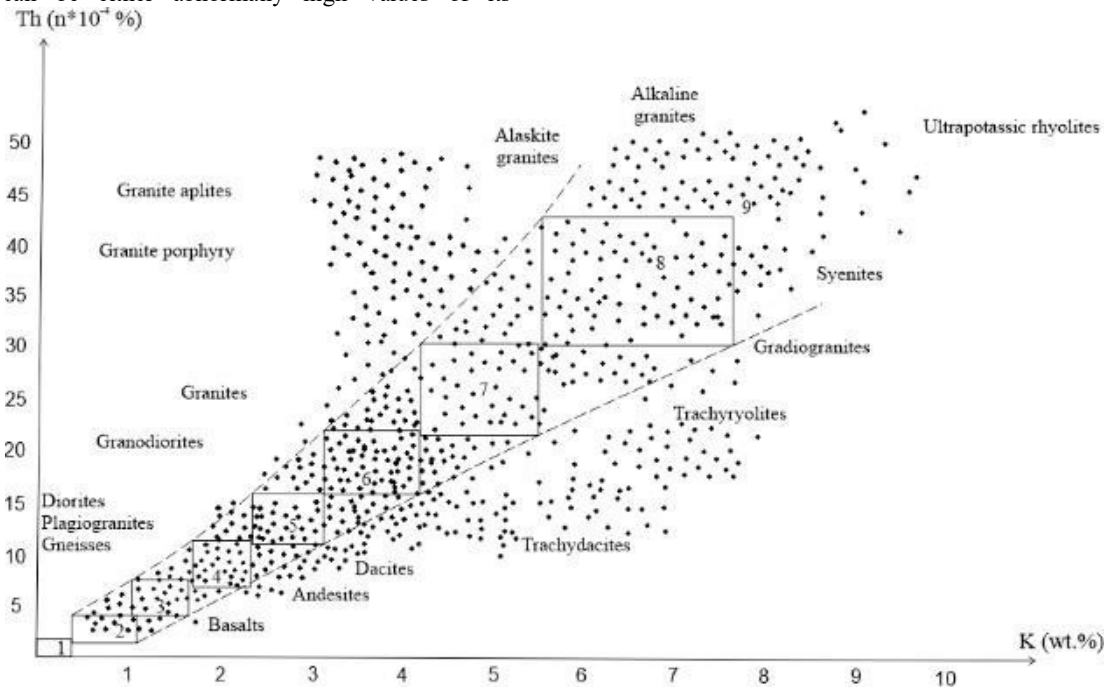

Fig. 1 Distribution of K and Th in igneous rocks of the Beltau-Kurama volcano-plutonic belt (Central Asia), the Okhotsk-Chukotka volcanogenic belt and in granitized rocks of the Kola Peninsula

This is primarily explained by the widespread development of magmatic formations of acidic and intermediate composition, which are generally characterized by an increased radioactive background due to fairly high contents of natural emitters, which are uranium, thorium and potassium (Fig. 1).

The area is characterized by fairly good exposure, which also explains the reason for the relatively high radioactivity, since a layer of sediment of a meter or more is a significant screen for radioactive radiation.

The processes of intense tectonomagmatic, hydrothermal-metasomatic, metamorphic and other activities taking place in the area in one way or another left their mark on the distribution of radioactive elements and their dynamics.

Analyzing the maps of U, Th, K content by area, it should be noted that the area southeast of Almalyk, the Akcha-Tolbulak area, is characterized

by increased intensity values of the uranium component.

Within the latter, volcanogenic formations of the Oyasak and Kyzylnura formations are widely developed. Uranium anomalies in the Akchatolbulak area coincide with the area of development of volcanic rocks of the Nadak suite (C2-3nd). Anomalous values of the uranium component up to 10 – 15 *10-4% stand out against the background of 2 – 6*10-4%.

Uranium in the triad of radioactive elements occupies, so to speak, an "independent" position and, in some cases, can and does participate in the formation of two or three-element radioactive anomalies (uranium-thorium, uranium-potassium, uranium-potassium-thorium), then Thorium and K40 are practically are consistently associated at a level of high positive or negative correlation.

Depending on the specific geological situation, areas of radio geochemically specialized systems for potassium or thorium are identified, one way or another in most cases spatially and genetically related to ore formation. First of all, it should be noted a clearly defined system of potassium anomalies, spatially falling on the northern slopes of the Kuraminsky ridge. This area is called the Almalyk ore district. Almost all non-metallic, gold-ore, gold-polymetallic and polymetallic deposits are located here (Kalmakyr, Sarycheku, Kauldy, etc.).

Local potassium anomalies with an intensity of 8-10% clearly stand out against the background of 3-4% and form a kind of ring-shaped structure, in the center of which values of intensity no more than 5% are noted, and on the outskirts of the ring they reach 10% or more percent. The intensity values of the thorium component in the center of the ring do not exceed 15*10-4%, and on the outskirts of the ring 30-35*10-4%. The thorium anomaly is "vaguer" in nature. A potassium anomaly with an intensity of more than 15% in the Akcha-Tolbulak area deserves close attention, where an increase in potassium contrasts with background or lower thorium contents, that is, a negative correlation between potassium and thorium, characteristic of ore deposits of the Chatkal-Kurama region, is manifested here. The anomalous zone, characterized by increased values of all three components of the radioactive radiation field within the Karabash depression, deserves attention. Intensity values for uranium are up to 1v 3*10-4%, thorium up to 50*10-4% and potassium up to 13%.

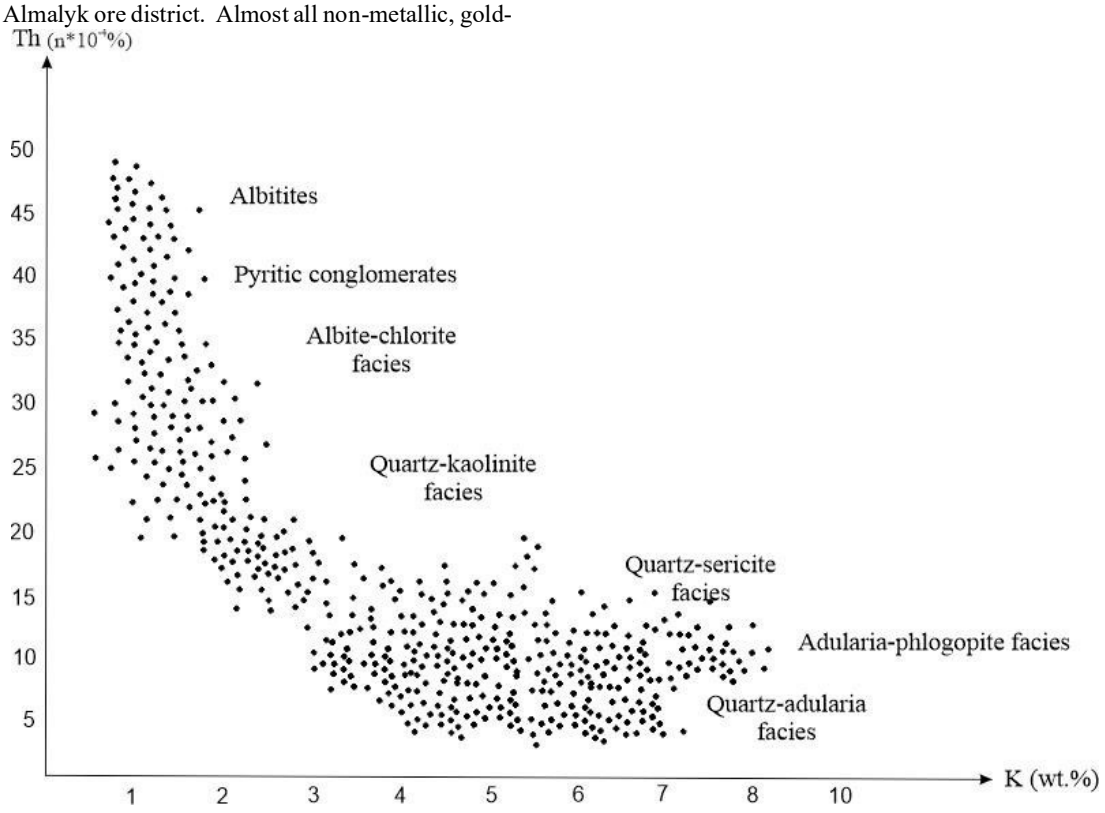

Fig.2 Distribution of K and Th in metasomatites of the Beltau-Kurama volcano-plutonic belt (Central Asia), Okhotsk-Chukotka volcanogenic belt.

Highly active volcanogenic formations are widely developed here, creating a complex structure of the radioactive field, emphasizing the tectono-magmatic situation within the Karabash depression.

A comprehensive consideration of gravimagnetic and airborne gamma spectrometric data makes it possible to draw important conclusions when predicting fluorite mineralization here. Constant values of the intensity of the uranium component characterize the area contained in the Kumbel-Arashan tectonic block, where the anomalous background is more than 6*10-4%, and local anomalies reach 12-14*10-4% (Fig.2).

Granites of the Upper Paleozoic age are especially radioactive. All known ore points fall on the area southwest of the Arashan fault, where a general increased background of the uranium component of the radioactive radiation field spectrum is noted. It should be noted that there is a pronounced potassium anomalous zone in the area of the Kumbel-Julasay tectonic block.

It is in this block that the potassium RGS region is identified and the well-known Chadak and Aktepa objects are located here, which today determine the metallogenic appearance of the research area (Chadak, Aktepa, Sarvak, etc.). Somewhat further north, in the area of the Kenkol-Arashain faults, areas of rocks with a significant potassium radio-geochemical specialization are also distinguished.

Ore occurrences of copper, bismuth and base metals are identified here. In this area, further to the north, a potassium RGS region has been identified, where manifestations of copper-bismuth mineralization are known. In the extreme eastern part of the area, behind the Satartau thrust, a potassium RGS zone is identified, where ore occurrences of gold-silver and copper-bismuth mineralization, numerous halos of gold and silver dispersion are known.

The second characteristic element for the area is the presence of formations that differ significantly in thorium RGS. They are installed at the southeastern end of the Kenkol and Arashan faults, as well as on the northwestern continuation of the Arashan fault.

Conclusion

The thorium RGS areas in the southeastern part of the Kenkol-Arashan tectonic block also do not play a prospecting role, although within their boundaries there are rare points with gold-silver and copper mineralization. In conclusion, a number of conclusions can be drawn:

1. The field of radioactive radiation created by the rocks of the region is significantly heterogeneous. The reason for the heterogeneity is, first of all, the development in the area of rocks with sharply contrasting radioactive properties from low-radioactive limestones to highly radioactive granite-porphyries and syenites of the Chatkal subzone.

The igneous rocks of the region are characterized by relatively small variations in potassium content. At the same time, there is a contrast in the thorium content: low (10-15*10-4%) within the Kurama subzone and high (reaching 6-7 clarks or more) in the Permian-Triassic granitoids of the Chatkal subzone.

2. According to the RGS parameter, the study area is divided into two large areas with a predominance of potassium and, accordingly, thorium RGS. Potassium RGS is released in the Beltau-Kurama volcano-plutonic complex; it induces andesite-dacite high alkalinity and hydrothermal quartz-sericite metasomatites. These rocks, as a rule, are part of the ore-promising paleovolcanic calderas of Hercynian age, which are promising for chalcophile mineralization. Within the Middle Tien Shan massif (Chatkal subzone) of the potassium RGS, areas of regional mineralization of Riphean plagiogneisses (with chalcophile mineralization), spatially close to them Lower Paleozoic clayey-carbonaceous shales and sandstones (O-S) are distinguished.

3. Detailed ground work has shown that such components of volcanostructures as potassium-specialized igneous rocks and wall-ore quartz-sericite and quartz-adularia metasomatites are most effectively induced.

They are reflected by combined zones of potassium RGS and potassium anomalies. These components of volcanic structures are spatially close to industrial chalcophile mineralization within the Kochbulak paleovolcanic caldera of the Chadak, Guzaksay, Kyzyl-Almasai and other ore fields.

The content of radioelements in the near-ore metasomatites of these formations is 3-6% potassium and 8-15*10-4 % thorium. Using the combined values of potassium RGS and anomalies, almost all known ore zones within the Kuramin subzone were identified, and new ore promising areas were identified on the poorly studied flanks of ore fields.

An AGSM survey within the Tereklinsky graben, located on the border of the Kuramin and Chatkal subzones, uses potassium RGS to record known ore occurrences of chalcophile elements. New promising areas are also identified in the south-eastern part.

Ground inspection showed that these areas are fields of development of secondary quartzites with quartz-sericite metasomatites and sulfide

mineralization. Further to the northeast, within the Chatkal subzone, three types of geological objects are distinguished by potassium RGS:

a) K-feldspathized sandstones C1, occurring at the base of the limestone sequence C1-C2. The potassium content in them is up to 5%, thorium 8-10*10-4%. K-feldspatization of sandstones is observed at the contact of the terrigenous strata with granitoids and in a number of cases%. K-feldspathization of sandstones is observed at the contact of the terrigenous sequence with granitoids and, in some cases, is accompanied by the formation of skarns with chalcophile mineralization (Cu, Bi);

b) carbonaceous shales and sandstones of the Lower Paleozoic (O-S). They contain local concentrations of rare metals. Potassium content reaches 6%, thorium 10-12*10-4%;

c) microclinites in Riphean plagiogranites. These regional structures, located in the watershed part of the Chatkal ridge in the northeast of the area, were first identified by the authors during AGSM survey. They contain up to 8% potassium and 8-12*10-4% thorium. Quartz-ankerite-calcite zones with chalcophile mineralization are spatially associated with zones of alkaline metasomatism.

ХАРАКТЕРИСТИКА ПОЛЯ РАДИОАКТИВНОГО ИЗЛУЧЕНИЯ ПО АНГРЕН-АЛМАЛЫКСКОМУ РУДНОМУ РАЙОНУ

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АННОТАЦИЯ

В данной статье приведены результаты исследований аэрогаммаспектрометрическим методом Ангрен-Алмалыкского рудного района с целью выделения радио геохимических специализированных (РГС) зон, где наблюдаются аномальные относительно среднего содержания концентрации U, Th, K40, что может являться свидетельством содержания в этих зонах тех или иных видов полезных ископаемых. Аномалиями поля могут быть либо аномально высокие значение его составляющих, либо такие изменения соотношений между ними, которые маловероятны для фоновых вариаций этих составляющих (либо и то и другое). Естественно, что наибольший интерес представляет второй вариант, поскольку методика выделенных перспективных аномалий на его основе оказывается сходной с методикой, применяемой при геохимических поисках, когда перспективность устанавливается по нарушению фоновый корреляции между наблюдаемыми элементами с выявлением доминирующего.

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КЛЮЧЕВЫЕ СЛОВА Поле радиоактивного излучения, среднее содержание урана, тория, изотопа калия, выделение перспективных аномалий, радиогеохимические специализированные зоны, литофильные, халькофильные рудные объекты

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ПУТИ РАЦИОНАЛИЗАЦИИ ОТВАЛООБРАЗОВАНИЯ В ГЛУБОКИХ КАРЬЕРАХ

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АННОТАЦИЯ

В статье рассмотрено формирование отвалов при различном карьерном оборудовании на примере карьера Кальмакир и приведены пути их рационализации. Приведены возможные варианты новых технологических схем при экскаваторном, бульдозерном и конвейерном транспорте, а также обоснованы условия возможного увеличения их высоты, базирующихся на концепции обеспечения безопасности ведения отвальных работ. Обосновано формировании отвалов на горных склонах и влияние на устойчивость главными факторами которых, является снижение прочностных и сдвиговых свойств пород во времени, особенности их отсыпки и возникающих в теле отвала процессов, влияющих на состояние основания отвала и отвальной площади в целом. Обоснована необходимость комплексного отвалообразования с применением циклично-поточных технологий (ЦПТ-1, ЦПТ-2). Описаны основные операции технологии отвалообразования с использованием консольных

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