REVIEW

of domestic scientific supervisor for dissertation work of
Aizhulov Daniar Yersenovich

on topic «The study of geological and hydrological processes of roll-front type deposits genesis», submitted to the dissertation council at Al-Farabi Kazakh National University for the degree of Doctor of Philosophy (PhD) in – «6D060300-Mechanics».

Kazakhstan is the world leader in uranium mining with 39% of the global market and the second largest in uranium reserves. Moreover, almost all exploited deposits are of infiltration origin, which are formed when useful components are leached from some rocks, transported by groundwater and deposited in other sedimentary environment. An important factor is the occurrence of ore-bearing permeable rocks among clay aquicludes (waterproof base and roof in the form of clay layers). In infiltration uranium deposits, rolls are common - crescent-shaped ore bodies caused by the movement of the flow of ore-bearing solutions. Therefore, a quantitative study and description of the mechanisms of formation of roll fronts would reveal the relationship between the horizons of impermeable rocks and the distribution in vertical and in plane views (i.e., contour) of the ore body.

The purpose of Aizhulov Daniar's dissertation work is: a) development of hydrodynamic and corresponding quantitative (i.e., numerical) models of the mechanism of formation of the roll front of an infiltration mineral deposit; b) use of the developed numerical model to identify and study the role of flow currents (streamlines) in the formation of rollsfronts in the ore-bearing formation; c) application of the developed method to more accurately determine the contour of the ore body, filtration characteristics and lithology of the formation in the interwell space, and mineral reserves.

The fact is that currently geostatic methods for determining the contour of the ore body, the lithology of the formation in the inter-well space and calculating mineral reserves well logging data from exploration wells located above the prospective deposit is used. In this case, the distribution of the mineral and the lithological properties of the formation at any point in the inter-well space, which are needed to determine the location of technological wells and calculate mineral reserves, are calculated from data from surrounding wells and depend only on the distance to these wells.

At the same time, Daniar, at the suggestion of a foreign conslultant, came up with the idea to find out the connection between the distribution of the mineral (uranium, in particular) in the formation with its history of origin, i.e. with the genesis of the mineral. If it were possible to establish such a connection, then this, as well as the construction and use of adaptive grids based on the known properties of the solution in computational fluid dynamics, would make it possible to construct an appropriate grid (usually uneven) for geostatic methods to more accurately determine the contour of the ore body and filtration characteristics and lithology of the formation in the inter-well space, to produce a more accurate calculation of mineral reserves.

Daniar coped with both of these tasks quite successfully, introducing the synthetic deposit method during the research to test and validate the proposed approach. The results obtained are presented in detail in dissertations and analyzed, so

there is no need to repeat them here.

The results of Daniar Aizhulov's research were published in fairly high-rated journals.For his report on the topic of dissertations at the IAEA conferences in Vienna in 2018, D. Aizhulov was noted and awarded.

In the course of completing the tasks of the dissertation, Daniar Aizhulov showed solid knowledge of research methods and diligence in achieving the goal, which was the basis for the successful completion of the work. Daniar also showed great independence in choosing methods for studying them and analyzing the results obtained, thereby showing himself to be a fully accomplished scientist.

Dissertation work of Aizhulov Daniar «The study of geological and hydrological processes of roll-front type deposits genesis», I consider to be fully completed. Aizhulov Daniar Yersenovich deserves an academic degree of Doctor of Philosophy (PhD) in «6D060300 - Mechanics».

Domestic scientific director
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