

REVIEW

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 committee within Al-Farabi Kazakh National University for the degree of Doctor of Philosophy (PhD) in «6D060300 - Mechanics»

Uranium deposits in Kazakhstan belong to the reservoir-infiltration type (RIT) deposits and are concentrated in permeable rocks, which allows mine them using the in-situ leaching method. A review of the literature on the features of the geological structure of RIT deposits showed that these deposits were formed due to the filtration of a mineral-containing solution in permeable rock and the deposition of uranium on a geochemical barrier. In the first section of the dissertation, an analysis of the mechanisms influencing the formation of RIT deposits was carried out, and a model of solution mass transfer was constructed taking into account the kinetics of chemical processes at the geochemical barrier.

In the second section of the dissertation, a method and a software tool has been developed for constructing a test geological model of RIT deposits, taking into account the specifics of their formation. Software functionality was developed to cover a test geological model of a field with a network of exploration wells, the data from which were subsequently used to analyze the accuracy of geostatistical methods.

The use of the developed tool to build a test geological model allows having a complete picture of the deposit and estimate the average and maximum error of the calculated mineral content at any point in the formation. Thus, a complete set of data is available for qualitative and quantitative assessment of existing geostatistical methods.

Daniar proposed the use of Pollack's algorithm to construct streamlines for constructing the contour of an ore body based on geological and hydrogeological data, which allows honoring the geological and hydrodynamic characteristics of the rock. A software module has been created that, based on hydrogeological data, calculates groundwater flow lines using the velocity distribution values determined from Darcy's law. Modules for constructing the contour of an ore body and calculating mineral reserves using geostatistical methods for infiltration-type deposits have been developed. A program code has been implemented for constructing the contour of the ore body.

A detailed comparative analysis of reserve calculation using the proposed and existing methods for various numbers of exploration wells was performed. The analysis showed that the streamline-based method provides higher accuracy in calculating reserves with a minimum number of wells.

The results of Daniar's research were reported at the specialized conferences RING Meetings (Research for Integrative Numerical Geology) and URAM-2018, organized by the school of geology of the University of Lorraine and the IAEA, respectively.

During his dissertation work, Daniar Aizhulov demonstrated deep theoretical knowledge and showed significant independence in choosing research methods and analyzing the data obtained, which confirms his scientific validity.

Aizhulov Daniar's dissertation work «The study of geological and hydrological processes of roll-front type deposits genesis» is fully complete, and he deserves an academic degree of Doctor of Philosophy (PhD) in specialty of «6D060300-Mechanics».

Domestic scientific consultant
PhD, Dr. Eng.
Tungatarova M.S.

[Signature]

Қолы жеткізілген
Подпись заверена

[Signature]

