**GEOLOGICAL FRAMEWORK AND THORIUM RESOURCES EXPLORATION CONDITION OF GEORGIA (THE CAUCASUS)**

**Avtandil Okrostsvaridzea,\*, David Bluashvilib , Nona Gagnidzea**

**a** Faculty of Natural Sciences and Engineering, Ilia state University, Tbilisi - 0162, Georgia

Email: [okrostsvari@gmail.com](mailto:okrostsvari@gmail.com)

**b** Faculty of Geology and Mining, Georgian Technical University, Tbilisi – 0136, Georgia

\*Email of corresponding author: [okrostsvari@gmail.com](mailto:okrostsvari@gmail.com)

**ABSTRACT**

The Caucasus represents a Phanerozoic collisional orogeny, that formed along the Eurasian North continental margin, extends over 1200 km from the Caspian to Black Sea**.** Georgian republic is situated in the central part of Caucasus Region. Here are marked 3 ore occurrences of thorium : 1-in the Greater Caucasus (Th concentrations vary between 51g/t - 3882g/t); 2- in the Dzirula massif (Th concentrations vary between 117 g/t -266 g/t); 3- in Vakijvari orefield (Th concentrations vary between 185 g/t - 428 g/t). Based on these data thorium ore occurrences found in Georgia should be treated as prospective resources**.**

Keywords: Caucasus, Geology, Georgia, thorium, resources.

**INTRODUCTION**

In light of exhaustion of hydrocarbons' reserves, new energy resources search is of vital importance problem for the modern civilization. At time of energy resources crisis, the radioactive element thorium (232Th) is considered as the main energy resource of our civilization future. Accordingly investigation of thorium should be one of the strategic interests for each state. Thorium ore mineralization is genetically related to alkaline-acidic magmatic rocks and its concentrations vary within the limits of 100-400 g/t in deposites. Geochemical analysis on metals were conducted at AcmeLab Vancouver laboratory on ISP-MS equipment using 15F method.

**GEOLOGICAL FRAMEWORK**

The Caucasus represents a Phanerozoic collisional orogen, that formed along the Eurasian North continental margin, extending over 1200 km from the Caspian to Black Sea and connecting the European and Asian branch of the Alpine-Himalayan mobile belt. It is expression of continental collision between the Arabian and Scythian plates and was formed after a long closure process of proto-, paleo-, and neo-Tethys. Currently three major units are distinguished structurally in the Caucasus construction: the Greater and Lesser Caucasian mobile belts and the Inner Caucasian Microplate [1]. The Greater Caucasus is the northernmost expression of the Caucasus orogen and is linked to the southern margin of Eurasian continent. In its construction two major stages are distinguished: Pre-Alpine crystalline basement and Alpine volcanic-sedimentary cover. The Inner Caucasian Microplate consists of a pre-Alpine crystalline basement, exposed in The Dzirula-, Khrami- and Loki massifs, that is overlain by an Alpine, non-metamorphosed and moderately folded Meso-Cenozoic volcano-sedimentary cover. The Lesser Caucasus is the southernmost expression of the Caucasus orogen, which in SW part is constructed of Paleogene-Neogenian formations of the Achara-Trialeti fold-thrust belt and which is considered as a back-arc rift trough. Georgian republic is situated in the central part of the Caucasus orogeny and includes all three structural units.

**THORIUM ORE OCCURRENCES OF GEORGIA**

Systematic investigation of Thorium reserves has never been carried out in Georgia and its ore occurrences have been discovered during the investigation of other ore elements. In Kakheti segment of the Greater Caucasus, while prospecting the gold mineralization, our group occasionally discovered industrial accumulations of thorium [2]. Also within the limits of Dzirula massif, again while prospecting gold, we fixed high concentrations of thorium [3]. In addition, in the 90-s of the 20th century, in Guria region, while prospecting uranium a group of Georgian Department of Geology detected high concentrations of thorium [4].

Kakheti segment is located in the eastern part of the southern slope of the Great Caucasus. The region is mainly built of intensely folded Lower-Middle Jurassic shales and sandstones. The whole complex of sedimentary rocks is crossed by numerous intrusive bodies of different thickness and composition. In the r. Stori Valley the sedimentary rocks have intensively experienced hydrothermal alteration. Here, in the quartz-plagioclase veins thorium content varies in the range of 51 g/t to 3840 g/t.

The pre-Mesozoic Dzirula massif is exposed in the central part of the Inner Caucasian Microplate. Near the village Nadaburi Cambrian quartz-diorite gneisses of the massif undergo intensive hydrothermal alteration and sulfide mineralization. Thorium high composition was fixed in these rocks (117 g/t - 266g/t).

Guria region is located in the western part of the Lesser Caucasus. It is built up by Eocene volcanogenic-sedimentary and intrusive formations. The thickest intrusive formation in Guria region is Vakijvari syenite pluton, around which strong hydrothermal alteration zones are developed. In this ore field anomalous contents of uranium have not been found, though three significant anomalies of thorium were exposed (average data): Nasakhlebi-1 (Th-185 g/t), Nasakhlebi-2 (Th-237 g/t) and Chkhikva (Th-428 g/t). Besides, Guria region the Black Sea magnetite sand, which is transported from Vakijvari orefield, may possibly contain thorium minerals.

**CONCLUSION**

Thus, as we see, in different regions of Georgia thorium concentration is clearly raised. According to modern demand thorium concentration on thorium deposit vary within the limits of 200-400g/t [5]. Correspondingly, relying on these data thorium ore occurrences of Georgia should be treated as prospective objects, therefore it is necessary to investigate them in detail and defin thorium reserves. Unfortunately, there is no other organization in the state, who emphasize the importance of this strategic raw material, fund and conduct the prospecting and exploration works. Generally, we consider complex investigation of thorium should be included into the sphere of strategic interests of the Georgian state.

ACKNOWLEDGMENTS

The authors wish to express gratitude to Shota Rustaveli National Science Foundation of Georgia for financial support of the project (# GNSF / ST09-1071-5-150) through which the research works were conducted in the Georgia.

**REFERENCES**

[1] Okrostsvaridze A, Tormay D., Phanerozoic Continental Crust Evolution of the Inner Caucasian Microplate: The Dzirula Massif. J Episodes, vol. 36, no.1, 2013.

[2] Okrostsvaridze A, Akimidze K., Bluashvili D., The First Data on Industrial Concentration of Thorium in Hydrothermally Altered Lower-Jurassic Clay Shales of the Stori Canyon (Southern Slope of the Greater Caucasus). Bull. Georg. Acad. Sci, vol.,5, no.1, 2011.

[3] Okrostsvaridze A., Thorium - Future Energy of Modern Civilization? and its Ore Occurrences in Georgia. Bull. Georg. Acad. Sci, vol.,8, no.3, 2014.

[4] Chkhikvishvili Z., Bandzeladze T., Kakabadze R., Report of Georgian Geological Department Tbilisi,. 1992, (in Russian).

[5] Bradley V. G, Gillerman V. S., Armbrustmacher T. J. Thorium Deposite of the United States – Energy Resources for the Future? U.S. Geological Survey. Circular 1336, 2009.