



Phosphorite of Arkheologicheskaya Grotto (Khakassya, East Siberia)

Yu. Zanin (1), R. Tsikin (2), A. Darin (3)

Institute of Petroleum Geology, Siberian Branch of Russian Academy of Sciences, 630090
Novosibirsk, (Email zanin@uiggm.nsc.ru)

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Y.N. Zanin (1), R.A. Tsikin (2), A.V. Darin (3) (1) Institute of Petroleum Geology, Siberian Branch of Russian Academy of Sciences, 630090 Novosibirsk, (2) Krasnoyarsk State Academy of the Nonferrous Metals, 660025 Krasnoyarsk, pr. Krasnoyarskii Rabochii, 95, (3) Institute of Geology, Siberian Branch of Russian Academy of Sciences, 630090 Novosibirsk. (1) E-mail: zanin@uiggm.nsc.ru

Phosphorites of the grottos were described for many times. Nevertheless, the detail study of this type phosphorites was never done, and authors did this work for the first time. Deposits and occurrences of phosphorites are wide distributed in the South of Siberia. In all cases, which were marked up in the literature, they are related to the secondary phosphorites formed during dissolution of primary phosphate-bearing rocks and phosphorites and they secondary reprecipitation in karst cavity. As for the phosphorites of the Arkheoloichskaya Grotto, it is the first occurrences of this type of phosphorite in Siberia. The grotto is related to the massive Lower Cambrian limestones. Its length is 205 and depth 23 meters. Its bottom deposits consists of rock blocks and the bone remains of the Grotto ancient residents and animals. The brown crusts of phosphorites are developed on the walls and the sailing of the grotto and close the rock blocks. It is possible to propose with great likelihood, that phosphorite represent the coprolite formed by bat guano. One of phosphorites petrographic peculiarities are the presence tubular forms with the external diameter 16-18 and internal diameter 10 microns. We interpret these forms as capsules of cyanobacterial threads, which were never observed early among subaerial phosphorites. For the chemical composition of

phosphorite the low content of CO₂ (1.65%), Cd (5,1%) and practically absent content of F (0,004%) must be pointed out. Among trace elements the character peculiarity of the Arkheoloichskaya Grotto phosphorites are the low content of U (1,8 ppm). This peculiarities of studied phosphorites are the result of the specific geochemical environments of their formation related to the decomposing guano. In the secondary karst cavity phosphorites of Obladzhane deposit, situated in the same region as, the content of CO₂ is 3.08%, F - 2.24%, U - 82 ppm. The content of REE in phosphorites of Arkheoloichskaya Grotto is rather low, too (La- 8.5 ppm, Ce-14 ppm, Nd 7.4 ppm, Sm-1.65 ppm, Gd-1.5ppm, Tb-0,25 ppm, Yb-0,67ppm, Lu-0.095 ppm). By the existent views [McArthur, Wolsh, 1986], the concentration REE in phosphorites takes place after their formation and ancient phosphorites are richer by these elements than young ones. This explanation may be accepted for the understanding of the low content of REE in Arkheoloichskaya Grotto phosphorites, take into account that their age is close to modern. The REE contents in studied phosphorites were normalized by shale. The poorly negative anomalies of Yb and Lu are observed at normalized graphs of REE. Negative anomalies of the normalized values of these elements are usual for ancient phosphorites, Lower Cambrian and Precambrian. The data of phosphorites of Arkheoloichskaya Grotto force to consider that this conclusion can be extended. The main ecologically-dangerous elements in phosphorites are Cd and U. Low content both of these elements in phosphorites of Arkheoloichskaya Grotto allows to use these phosphorites immediately as fertilizer in the form of phosphorite mill or for the production of any kind of phosphate fertilizers. This work was supported by the Russian Foundation for Basic Research, project no. 04-05-64075.