Geophysical Research Abstracts, Vol. 8, 00538, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00538

Uranium in supergene phosphorites

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The uranium content in supergene phosphorites composed of calcium phosphates of carbonate-apatite group has been studied using their representative collection. By the geological characteristic supergene phosphorites taken for the investigation were subdivided into four groups:formed in the areas of the sedimentary rocks weathering, in the areas of the endogenous rocks weathering, formed on the ocean island and lake coprolites. As regards the textures among studied supergene phosphorites the massive, concretionary, coprolite, cork thick-layered (the thickness of layers is measured by centimeters or millimeters) and thin layered (the thickness of layers is lesser than 1 millimeter) are distinguished.The contents of P_2O_5 (24-40%) and CaO (34-57.67%) in the studied phosphorites are stably high but contents of F (0-4,07 %) and of such main isomorphous admixtures in carbonate-apatite as CO_2(0.17-5.03 %) and Na_2O (0.04-1.23 %) vary very much. The content of uranium in studied supergene phosphorites fluctuates from 0,5 to 790 ppm, mainly within the limits of 5-100 ppm (65% of total number of analyzed probes). The uranium content in supergene phosphorites formed in the areas both sedimentary and endogenous rocks are as a whole in the same limits. As for coprolite phosphorites then in the cave coprolite phosphorite formed in aerobic environments the uranium content makes up 1.8 ppm whereas in lacustrine coprolite phosphorite the average uranium content equals 141.6 ppm. The formation of supergene phosphorites in the aerobic environments forces to think that the main way to concentrate uranium was its sorption as uranyl by phosphate minerals. It is possible to verify that the content of uranium in supergene phosphorie can be both higher and lower than in primary marine phosphorites. Realized correlation analysis for all analyzed samples has indicated that the uranium is not correlated at the level of the confidence probability 0.95 % for any component of the carbonate-apatite composition. This correlation is

observed distinctly for P_2O_5, CaO, F only for regions and especially for concrete deposits. As regards such isomorphous admixtures as Na_2O and carbonate-ion their significant correlation with uranium is unsteady and can be absent even within the individual deposit. The important role in the uranium concentration in phosphorites play their texture peculiarities. Despite of series declinations, it is possible to ascertain that crusted phosphorites, and especially the thin-laminated crusted ones, often are characterized by the higher uranium content than the underlying massive ones. The maximal content of uranium (790 ppm) for all investigated samples is related just to thin-crusted phosphorite. By the opinion accepted by authors the massive phosphorites are the result of the one-time precipitation of phosphate material from the colloid solutions, as phosphate minerals of the thin-laminated phosphorite crusts were formed during multiply recurring chemical crystallization from the true solution, that intensified the sorption ability of the formed phosphate minerals.

This study was supported by the Russian Foundation for Basic Research, project 04-05-64075