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Actinium removal from rare earths concentrate produced by processing of uranium ore

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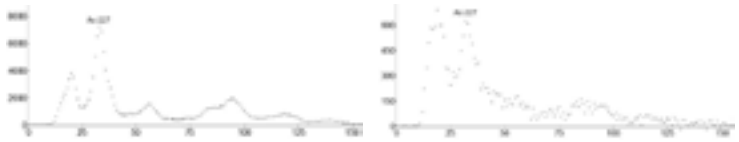
Currently, rare earth elements (REE's) and products based on them are widely used in many industries, including the nuclear industry, where REE's (mostly Eu, Gd and Sm) are used for control rods production as neutron absorbers. It is well-known that rare earth elements are often accompanied uranium ores. Currently, technologies of associated REE's recovery from uranium leaching solutions, phosphorites, etc. are developed. These technologies allow removing main components and contaminants uncluding uranium, 232, 234, 230Th, 226Ra and their daughter radionuclides. However, the concentrate containing 50-90% of REE's has activity concentration of 10^4-10^5 Bq kg^{-1}. This activity is mainly conditioned by β-emitter 227Ac which is a relatively long-lived (21.8 a) daughter of 235U.In this paper we studied the possibility of deactivation of the REE's concentrate produced from technological solutions after uranium in-situ leaching. Studies have focused on the sorption separation of REE's from 227As using ion-exchange materials, synthesized via suspension copolymerization of various extractants, styrene and divinylbenzene.The developed deactivation technology was tested under industrial conditions at the uranium mining plant. Approximately 100 g of the REE's concentrate with high activity was treated; this resulted in production of 90 g of deactivated REE's concentrate with a the activity concentration of (1-5) × 10^3 Bq kg^{-1}.



Biography

Sergey Kirillov (UrFU) has over ten years of experience on hydrometallurgical research. He has wide knowledge of hydrometallurgical unit operations such as ion-exchange, solvent extraction, precipitation for recovery of REEs and precious metals from secondary sources based on his work at Department of Rare Metals and Nanomaterials, Ural Federal University (UrFU). He is an author of more than 15 publications in these research fields. He works on his Ph.D. studies under supervision of Professor Vladimir Richkov (UrFU). He is carrying on his Ph.D. research on hydrometallurgical approach for recovery of rare earth metals from phosphogypsum.

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