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Radiochemical separation of uranium and protactinium from neutron irradiated thorium.

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The aim of this work was elaboration of radiochemical scheme for separation micro-amounts of uranium and protactinium from macro-amounts of Th, what can be helpful in nuclear power engineering for the analysing thorium-uranium fuel cycle as well as IV generation nuclear reactors. Naturally abundant isotope of thorium, ^{232}Th is the fertile material. In the nuclear reactor, ^{232}Th is transmuted into the fissile artificial uranium isotope ^{233}U . Elaborated separation procedure is based on extraction chromatography, which combines the selectivity of liquid-liquid extraction with the rapidity and quantitativity of chromatographic methods. In first step, Pa is quantitatively isolated from micro-amount of U and macro-amount of ^{232}Th on the column filled with TOPO supported on hydrophobic sorbent. Next, effluent containing thorium and U traces is loaded onto the column filled with quaternary aliphatic amine and an elution is conducted with a mixture of nitric and hydrofluoric acids with an addition of aluminium nitrate and H_2O . Uranium is selectively eluted with first 5-10 mL, whereas Th is eluted in next 35-40 mL.

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