

Where and how is uranium enriched?

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What is the essence of the enrichment process? Production of nuclear fuel for the majority of NPPs in the world is impossible without uranium enrichment.

The physical nature of the enrichment process does not depend on the method of enrichment. Basically it means extracting a certain amount of uranium-235 from natural uranium mixture (where the content of isotopes of uranium-235 is around 0.71% and uranium-238 – 99.29%). Thus the relative content of uranium-235 in the remaining mixture (product) increases. Since the chemical properties of uranium isotopes are identical, the enrichment is based on a physical process involving the different behaviour of atoms and molecules of different mass. Nowadays enrichment plants use the centrifuge process. A very rapid rotation of the working cylinder inside the separating centrifuge makes heavier gas molecules descend and concentrate at the wall, and the lighter ones - near the cylinder axis. Thus one can benefit from some enrichment in isotopic composition. The process is repeated over and over again. Centrifuges are combined in clusters (in parallel to increase productivity) and chains (consecutively, to increase the level of enrichment).

As centrifuge separation is carried out in the gas phase, there is a need of intermediate product for enriching uranium, which is uranium hexafluoride (UF₆) – the only uranium compound that can exist in a gaseous state under reasonably achievable technical conditions. Uranium hexafluoride is the product of uranium conversion – a chemical- technological method of processing uranium concentrate.