# Relation of Transuranium Isotopes Yields as Indicator of the Achieved Neutron Fluences at the Pulse Nucleosynthesis

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The possible perspective way for production of transuranium isotopes is the artificial rapid nucleosynthesis (in the nature the *r*-process and the next decays of neutron rich nuclei are responsible for isotope abundance) realized under explosive conditions. The process is the consistent multiple neutron capture by irradiated target (manufactured from the $^{238}$U or more heavy/mixture isotopes as $^{232}$Th, $^{237}$Np, $^{238}$U, $^{242}$Pu, $^{243}$Am). An intensive synthesis is ensured by extremely high neutron fluence (several units of $10^{24}$ neutrons/cm$^2$) during the short time exposition (~$10^{-6}$ s). The first time the creation of isotopes with neutron excess up to mass $A$=255 was obtained and discovered in the Mike experiment [1]. During the Plowshare program and some next nuclear tests (as Anacostia, Kennebec, Par, Barbel, Tweed, Cyclamen, Kankakee, Vulcan and Hutch) the transuranium isotopes up to A=257 was registered [2–5].

In the realized pulse nucleosynthesis model it were considered the sequential (n,γ)-neutron captures by mono isotope $^{238}$U target and binary ($^{238}$U + $^{239}$Pu)-variant for case of $^{239}$Pu injection [6,7]. The model includes the temperature decrease during the adiabatic expansion with index γ = 1.5 at the initial temperature ~20 keV and linear velocity ~190 km/s. Here we simulated the isotope yields for Mike, Anacostia, Barbel, Par and Vulcan experiments. The obtained results indicated on the roughly linear dependence of the isotope *Y*-yield relations from the neutron fluence [8]. Namely we considered the next pairs of neighboring isotopes with atomic masses $A$=245 and 244, $A$=246 and 245, $A$=247 and 246. The relation 246/245 (i.e., yields with masses $A$=246 and 245) depending on the fluences is the most strong demonstrator of the linear dependence. The results allow to consider these relations as indicators of the achieved neutron fluences in the experiment.

## References

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