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INVITED LECTURE - Radionuclide Production at Accelerator with High Power Targets

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The isotope production facility at 160 MeV proton beam of linear accelerator in the Institute for Nuclear Research of Russian Academy of Sciences (Troitsk) has the following characteristics providing high power irradiation:
- 4⊠-cooling of the targets (from 1 to 14 targets at one time);
- slanting 26o-angle beam on the target;
- lithium beam window between accelerator vacuum and cooling water of the target cell;
- a system of 4 cooled graphite collimators with thermocouples monitoring the beam shape directly before the targets;
- beam sweeping providing heat distribution.
General requirements for target materials at high intensity accelerator beams are the following: high cross-section of the radionuclide in the particle energy range; high abundance of the main producing material; known and acceptable non-radioactive impurities; high temperature stability; high heat conductivity; high radiation stability; low vapor pressure; low interaction with target shell or cooling water; low toxicity of the main material and impurities in case of medical isotope production; acceptability for radiochemical processing. A compromise between these requirements is to be provided in the most cases. Calculation with ANSYS program ensures the correct choice of target material and irradiation regime.
High yields are resulted in producing 82Sr from metallic Rb-target in stainless steel shell, 117mSn from Sb-containing targets in graphite, Nb- or Mo-shells, 225Ac and 223Ra from Th-target in graphite, Nb- or Mo-shells, 22Na from Al-target, 103Pd from Ag-target, 72Se from GaAs-target, 68Ge from GaNi, etc.‘
New approaches are considered to irradiate cycling liquid rubidium targets to produce large amounts of 82Sr, and cycling lead-bismuth targets for radionuclide production and on-line extraction.

Author: Dr ZHUIKOV, Boris (Institute for Nuclear Research of Russian Academy of Sciences, Russia)

Co-authors: Dr ERMOLAEV, Stanislav (Institute for Nuclear Research of Russian Academy of Sciences); Mr KOKHANYUK, Vladimir (Institute for Nuclear Research of Russian Academy of Sciences)

Presenter: Dr ZHUIKOV, Boris (Institute for Nuclear Research of Russian Academy of Sciences, Russia)

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