**BINP accelerator based neutron source**

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A source of epithermal neutrons for BNCT is proposed and created basing on the tandem accelerator with vacuum insulation and a lithium target.
Accelerator is characterized by the rapid acceleration of charged particles. High-voltage strength of vacuum gaps, the dark current behavior, beam focusing, acceleration and striping are studied. Stationary proton beam with an energy of 2 MeV and a current of 1 mA is obtained. The beam is highly monochromatic in energy - ± 0.1 %.
Neutron generating target for BNCT is proposed, developed and experimentally investigated. The target is a thin disc intensively cooled, coated with thin layer of lithium on the side of the proton beam. Target is cooled with water, earlier with liquid gallium. V, Ta, alfa-Fe were defined to be the material most resistant to blistering. Problem of target activation by radioactive isotope Be-7 was solved by developing a protective subsurface container for holding and temporary storage of activated targets designed as a long steel cup with a lead cover immersed in the ground.
It is proved that the Beam Shaping Assembly which includes filters of $MgF_2$, Al and Ti, allows us to keep directionality of neutron flux due to kinematic collimation at 1.915-2 MeV protons, and to use the near threshold mode attractive due to low activation. The Beam Shaping Assembly at 2.3-2.5 MeV protons allows forming orthogonal neutron beam providing high quality of the beam for BNCT and bringing a new opportunity to direct a neutron beam at any angle and to irradiate the patient from all sides.
Neutron generation is realized, and experimentally measured: the neutron flux through 7Be activation and activation of NaI scintillator of gamma-ray spectrometer, neutron spectrum by BDT and BD100R bubble detectors and TOF technique using innovative technical solutions generating short pulses of neutron radiation, the spatial distribution of neutron dose with dosimeter-radiometer.
Tandem accelerator with vacuum insulation with specialized targets can generate monochromatic neutrons for calibration of dark matter detector, the fast neutrons for fast neutron therapy and for dating rocks, monochromatic gamma rays with energy 478 keV, resonance 9.17 MeV gamma rays for the development of techniques prompt detection of explosives and narcotics, alpha particles to explore promising neutronless thermonuclear reaction $^{11}B(p,alfa)^2alfa$ and positrons in the reaction $^{19}F(p,alfa)^{16}O$.

Topics : Target Cooling ; BNCT