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A study of the characteristics of a pulsed accelerator-driven BNCT neutron source based on lithium targets

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In recent years, neutron capture therapy (NCT) has transitioned from utilizing reactor neutron sources for research to employing accelerator-driven neutron sources for practical applications, thanks to advancements in accelerator technology. Pulsed accelerators have emerged as a viable option for neutron sources in NCT due to their compact design and cost-effectiveness. When creating accelerator-based neutron sources for NCT the main reaction is considered for potential use is 7Li(p, n)7Be. Limitations associated with the thermophysical properties of lithium actualize the optimization of the target design, especially when generating neutron fluxes using pulsed proton sources. Comparative simulation analyses of neutron yield characteristics from lithium and lithium compounds bombarded by 2-2.5 MeV pulsed proton beams with wide energy spectra have been conducted. The potential for increasing neutron flux has been explored through investigations into target thickness, neutron energy spectrum distribution, and emission angle distribution. The results indicate that optimizing the target's composition and structure significantly enhances neutron yield, providing a theoretical basis and promising prospects for the development of compact BNCT neutron sources.

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