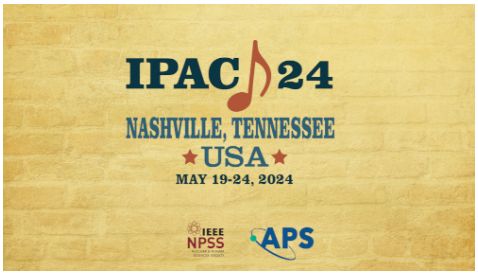

Contribution ID: **1125** Contribution code: **MOPC60** Type: **Poster Presentation**

Optimization design of photoneutron source for detecting dissolved substances in aqueous solutions

Monday, 20 May 2024 16:00 (2 hours)

Measuring the composition and content of dissolved substances in aqueous solutions is in demand in fields such as biomedicine, and industrial production. The material analysis technique based on thermal neutron capture reaction is one of the commonly used methods for analyzing the composition and content of dissolved substances in aqueous solutions. The material analysis technology based on thermal neutron capture reaction requires the selection of appropriate neutron sources. Due to its mobility, high neutron yield, moderate cost, controllable beam output, and being a pulse type neutron source, photoneutron sources are suitable for detecting dissolved substances in aqueous solutions. In this article, design and optimization of a photoneutron source based on a 7 MeV electron accelerator was done using the Monte Carlo simulation. At 1 μA current, the photoneutron sources can yield 1.6e+8 neutrons per second. The detection of gadolinium concentration in aqueous solution was carried out using this photoneutron source. The results showed that in 5-minute, the measurement error did not exceed 15% when the gadolinium concentration was between 0.6 g/L and 1.0 g/L.

Footnotes

Funding Agency

Paper preparation format

Word

Region represented

Asia

Primary author: ZONG, Chunguang (Tsinghua University)

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Session Classification: Monday Poster Session

Track Classification: MC1: Colliders and other Particle and Nuclear and Physics Accelerators: MC1.A08 Linear Accelerators