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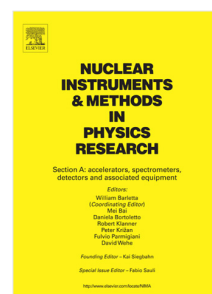
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Beta detection of strontium-90 and the potential for direct in situ beta detection for nuclear decommissioning applications

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Abstract

Strontium-90 is one of the primary beta-emitting radionuclides found at nuclear decommissioning sites. Monitoring its activity in the environment is of utmost importance given its radiotoxicity. Current procedures for the beta detection of strontium-90 are time consuming, produce secondary waste and expensive. There is a demand for real-time in situ radiostrontium monitoring in groundwater at nuclear decommissioning sites. This paper presents a review of existing techniques for strontium-90 monitoring and examines a novel approach through direct beta detection with a gallium arsenide photodiode based detector. A proof of concept detector was modelled in the physics simulation software, Geant4, and evaluated as candidate for in situ detection of beta emitting radionuclides. The simulation results indicate that the detector is physically capable of counting 89.86% of incident 0.546 MeV electrons from a 1 cm range in water. This validation will provide the basis for further development of an in situ beta detector.

Keywords: strontium, beta, radiation, detection, photodiode, gallium-arsenide, groundwater

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¹The authors declare no conflict of interest.

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