

Juan Luis Cuadrado Torres

Major: Electrical Engineering

University: Polytechnic University of Puerto Rico

Faculty Mentor: Dr. William Miller

Mentor Department: Nuclear Science and Engineering Institute
(NSEI)

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Participation

Gamma/gamma coincidence suppression system for detecting mercury

The Missouri University Research Reactor has the ability to measure Mercury (Hg), an environmental contaminant, using neutron activation analysis. This process turns Hg into radioactive Hg-203 which emits a 279 keV gamma-ray that can be easily detected using a High Purity Germanium (HPGe) detector. The result can be used to determine the percentage of Hg in the sample. Unfortunately, samples containing Hg may contain Selenium (Se) which is activated to Se-75, also resulting in a 279 keV gamma-ray. The problem is that these two signals can not be separated by the HPGe detector. Fortunately, Se-75 also emits another gamma-ray at 121 keV in coincidence with the 279 keV gamma-rays. If the sample to be analyzed is placed in the middle of a plastic scintillator, a coincident count between the HPGe and the plastic scintillator will indicate a Se-75 decay which can be rejected by an electronic coincidence counting circuit. The remaining counts at 279 keV will represent only the presence of Hg and will result in a corrected measurement for Hg content.