



Apr 11th, 2007 - 10:00 AM

Detecting Gamma-rays with Quantum Dots

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Advisor's Department:	Physics
Funding Source:	UMR Opportunities for Undergraduate Research Experiences (OURE) Program

Detecting Gamma-rays with Quantum Dots

The purpose of this experiment is to demonstrate the ability of CdSe quantum dots to detect gamma radiation. Current methods for the detection of gamma radiation require large voltages and possess only semi-portability; moreover, detection of gamma radiation while accurate is plagued by material inefficiencies. Hence, there is need for small portable and efficient gamma-ray detectors. The ability of quantum dots to detect radiation has been predicted but not thoroughly examined in the laboratory. Here we prove that semiconductor quantum dots can be used to detect gamma radiation. Exposure of CdSe quantum dots to gamma rays causes a notable increase in their fluorescence. The increase of luminescence is probably due to photocorrosion of defects, and was found to be linear in the range 20-200 kRad. Quantum dot detectors might represent a simple, rugged, solid state device capable of providing portable and accurate gamma-ray detection.

Michael is a junior attending the University of Missouri-Rolla majoring in Physics and Nuclear Engineering with a minor in Mathematics. He is the son of David Hoffman and Tonya Toeppen and is from Russellville, MO. On campus he is an active participant in the American Nuclear Society, the Society of Physics Students, and the Dean's Academy. Michael is currently involved with multiple research projects and tutors students in the Physics Learning Center. Michael plans to attend graduate school and begin a career in research and development at an advanced laboratory or university with the intention of becoming a professor of physics.