CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
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Project Number
36590

Project Title
Gamma Radiation: The Effects of Shielding

Abstract

Objectives/Goals
In todays society, the current standard for radiation shielding protection is the use for large lead and concrete blocks to shield against radioactive sources. Examples of this are particle accelerator facilities in nuclear power plants. However, lead and concrete are very heavy and difficult to install in smaller devices like robots. Currently, at the Fukushima plant in Japan they are having trouble sending in robots to explore inside the damaged plant. The radiation inside is so strong that it short circuits the robot wires and essentially disables the robot immediately. This project aims to explore new shielding combinations that are much lighter than lead, but provide the same level of protection against radiation. The goal is to have a material light in weight and can have the robot incased in it, in order to protect it against the intense level of radiation found inside a nuclear power plants core.

Methods/Materials
First, I placed a radioactive Co-60, isotope sample (1 uCi) in a tray stand. Next, I took the probe of a Digital Geiger counter and placed it on top of the stand. Once I took 20 CPS, I placed one layer of shielding material between the isotope sample and the probe, then repeated this process until I got to 4 layers of shielding. I did this until I got 10 different combinations of 4-layered shielding materials. I also used water as a shielding material as well as different alloys I created.

Results
My results show that certain combinations of aluminum serve just as well, if not even better, than lead radiation absorbers, as well as being much lighter. Further investigation should be carried out to test these results more.

Conclusions/Discussion
In conclusion, if my results are correct, there is a chance that the robots and different equipment in Fukushima could potentially be covered with a much lighter material, that could also be just as effective as layers of thick lead and concrete.

Summary Statement
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Help Received
Mr. Levon Dovlatyan