Graduate student seminars

Wednesday, December 2

4pm

Hill Hall 202

Functionalization of Polymers with Fluorescent and Neutron Sensitive Groups for Efficient Neutron and Gamma Detection

Adam C. Mahl

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The Colorado School of Mines

Abstract. Efficient large scale detectors for gammas and neutrons are needed to provide radiological security at international borders and at other sensitive sites. Currently deployed at these sites are large (O(sqft)) gamma detectors, which can be liquid or solid organic scintillators while neutron detection is achieved by a combination of the moderating plastic material and 3He filled proportional counters. As 3He has become scarce and expensive due to its widespread use in radiological security scanners, replacement of 3He based neutron detection is integral for both academic and national security reasons. This project is an interdisciplinary collaboration between researchers from the chemistry/polymer science and nuclear physics groups at CSM to do basic research on the synthesis of scintillating polymers directed at significant improvement in light output, incorporation of neutron sensitive isotopes, as well as a reduction in production cost.

The current research directions and accomplishments will be detailed:

1. Optimization of scintillation performance via the development, characterization, and admixture of various novel (and standard) fluors that are highly soluble in plastic matrices to provide more efficient light production, PSD capabilities and control of emission wavelengths to match common photo-detectors.

2. Developing and characterizing highly soluble, 10B containing materials that can act as both thermal neutron and alpha/gamma detection groups within the scintillator via PSD methods.

3. Combination of 10B material with primary fluors into a single molecule will lower dopant concentrations in matrices improving thermos-mechanical stability, and possibly allow for co-polymerization to improve FRET, and enhance scintillator properties.

The progress, insights, and accomplishments from the first year of work will be presented; highlighting the synthesis and testing in various polymers of novel fluors and boron compounds.

Biography. Adam C Mahl, a 5th year Ph.D. candidate in the Nuclear Physics group at The Colorado School of Mines, with a research focus in radiation detection methods and detector development and a Master's background in Nuclear Engineering.

Storage of Spent Inert Matrix Fuels

Tessa Rider

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Abstract. The build up of nuclear waste in the US is an issue of growing concern. Inert matrix fuels have been found to be useful in reducing the build up of nuclear waste, however there are aspects of inert matrix fuels that still need to be researched in order to determine if inert matrix fuels will be licensable. One of these aspects is the storage of spent inert matrix fuels. Ideally we would like to be able to store inert matrix fuels using the infrastructure in place to store spent uranium dioxide fuel. My presentation discuses the research I have done to so far to determine if inert matrix fuels can be stored safely at the end of their life.

Biography. Tessa Rider is a first year graduate student at The Colorado School of Mines. She received her bachelor decree in Engineering Physics at The Colorado School of Mines. Currently she is researching the storage of spent inert matrix fuels. This research is part of her fellowship from the Integrated University Program funded by the US Department of Energy.