

In the Hunt for Research Bucks!



Dr. Castano's Group - Activity Report:

A little update to all... I have a new office in Fulton 224, and I am still adapting to my job as a tenure track assistant professor. This year has been particularly intense because of the multiple tasks required from professors, which include teaching new courses, service in multiple committees, student advising, research, and preparing research proposals to raise money to do the aforementioned research. All this is a set of complicated activities to balance at a time when research funding is difficult to obtain. Fortunately, I have help from some of you in pursuing interesting research initiatives, even as we struggle with little funding.

Since I have been unable to obtain research money independently so far, a broad range of exploratory activities have been pursued with your help. In the case of NE-308, seven groups of students pursued research initiatives with various degrees of success. Interestingly, we irradiated animals and plants to observe radiation effects on their development, growth, or conservation (planaria, crop beans, iris flowers, salmonella) as well as studying other applications (plastic hardening, money radiotracers, and neutron radiography of hydrides). With Edwin Grant (NE Grad) we are still doing some further planaria testing.

Chrystian Posada my first graduate student arrived in January of this year. He had previous research experience in biological systems. Since then we have travelled to Idaho National Laboratory in June to the 2009 Advanced Test Reactor (ATR), Users Week. We plan to use ATR for material testing of special type of cement that would be adequate for gamma and neutron shielding of long term nuclear spent fuel storage and/or disposal (more to come).

The preliminary measurements are being conducted with the help of Prof. Henry Colorado from Universidad de Antioquia (currently at UCLA). He is creating the samples that are to be used in the experiment. Jason Pleitt (NE undergrad) is engaged in fabricating the device to measure the linear attenuation coefficient of the samples.

Thanks to Chrystian's dedication, Dr. Kumar's modulated beam mass spectrometer for exquisitely sensitive hydrogen measurements has been refurbish and is about to start roaring again. Chrystian have also helped me design and build a new type of Devanathan-Stachurski electrochemical cell including insitu X-ray diffraction that could put to rest an old debate on the nature of true nature of nickel hydride (important for hydrogen storage).

The latest addition to our group, thanks to funding provided by the Energy Research and Development Center (ERDC), is Jessika Rojas who has previous experience on material characterization and phase identification of stainless steels using X-ray diffraction. A research she presented at the 58th Denver X-Ray Conference last month. Jessika has also worked previously on mammography X-ray radiation dosimetry and quality control for X-ray room Radio-diagnostics.

Chrystian and Jessika are helping me also to pursue the development of materials that can store substantial amounts of hydrogen. This prospective research line is being done in collaboration with Andrei Lipson an old friend with whom I have worked before on hydrogen in materials. These materials can help us in the US to transition from our fossil fuel-based economy to a hydrogen fuel based economy. In particular, we are interested on the incorporation of nanoparticles into single wall carbon nanotubes (SWCN's) for hydrogen storage (more to come).

With Dr. Usman, and David Gallego (NE Grad) we have been studying electrical conductivity induced on insulators by neutron radiation. This is an interesting subject with potential applications into the failure of miniature semiconductor devices due to cosmic rays (at sea level 98% of cosmic rays are neutrons).

Last but not least, we are interested in studying the effect of free hydrogen in the ozone of the upper atmosphere. To that effect, Ryan Wohldmann (NE undergrad) with OURE funding (partial) and help from Chrystian is re-engineering a glass vacuum chamber donated to our group by Dr. Mueller. The objective is to obtain reliable data of the influence of hydrogen on the dynamics of ozone. Hydrogen is unavoidably released during normal operations, and the hydrogen economy might have unexpected negative impact in the ozone layer. This is a question of utmost importance, since ozone is vital for all life on the surface of the Earth.

Cross your fingers with me, we are stretched thin and really need some of those research bucks. 😊