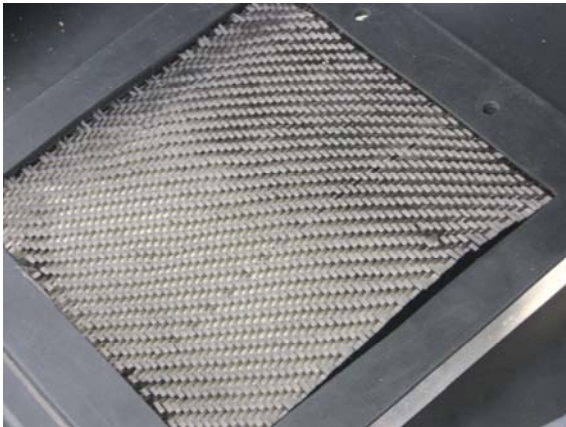


I am a student at Evergreen who came to Evergreen looking to educate myself in the sciences. My end goal is a career in science with an emphasis in the area of hydrogen fuel cells. I received funding from the Clean Energy Initiative here at Evergreen for an undergraduate research project I am working on under the guidance of Rebecca Sunderman. I would like to extend my thanks to the Clean Energy Committee and the Evergreen student body. The Clean Energy Initiative offered a source of funding that helped me to do research into more sustainable practices that could be applied in the burgeoning hydrogen fuel cell industry. I would like to tell you a little about it here.

Hydrogen fuel cells are a promising environmentally sustainable technology, but are still not competitively priced with current energy technologies. In the past this fact has kept them out of reach for the average consumer. There are great benefits to exploring less expensive materials and more sustainable manufacturing techniques to produce hydrogen fuel cells. Platinum is the most common catalyst used in a hydrogen fuel cell. Electroplating platinum onto carbon fiber cloth is a common practice in the manufacture of fuel cells. Electroplating involves the use of some fairly dangerous chemicals that have to be remediated once they are finished being used. This is expensive and environmentally hazardous. This area needs improvement both in terms of cost and environmental impact. Using less expensive metals that will perform the same catalytic function as platinum is one way of cutting costs involved with making hydrogen fuel cells. Palladium and titanium will perform this function when in combination and are significantly less costly than platinum. My research approaches both the angles of sustainability and cost reduction by exploring thin film vapor deposition as a process to manufacture hydrogen fuel cells giving an added cost advantage. This technique can make better use of precious metals by applying much less of them in the cell. It also generates virtually no waste, toxic or otherwise.

The technical details: I used a high vacuum chamber that I converted to a sputter coater to coat palladium-titanium onto carbon fiber cloth. I made several modifications to a Varian 3117 high vacuum chamber to convert it to a sputter coater. Samples of carbon fiber cloth, which is very conductive, were coated using the sputter coater. The coater was fitted with a Pd-Ti sputtering target (so called because it is bombarded by the plasma). Scanning electron microscopes were used to verify results of the sputtering process and evaluate the quality of the coated samples. Once I get the samples coated with enough of the right metals a fuel cell will be built with them.



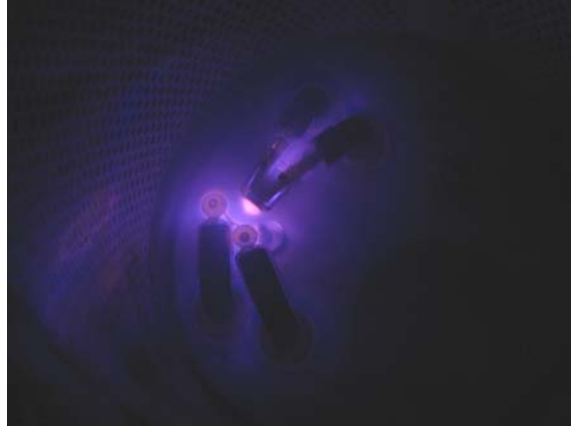
Carbon fiber cloth in the fuel cell I'm building.



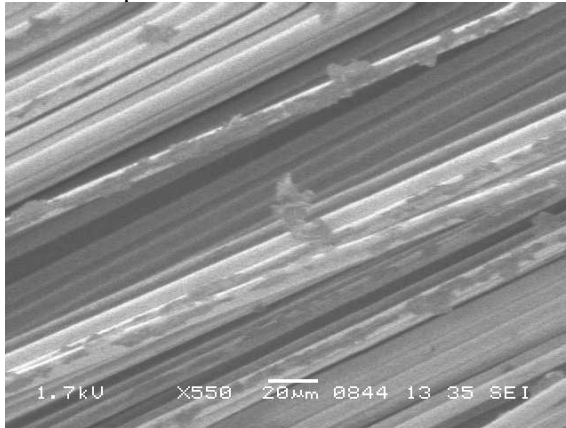
The converted sputter coater.



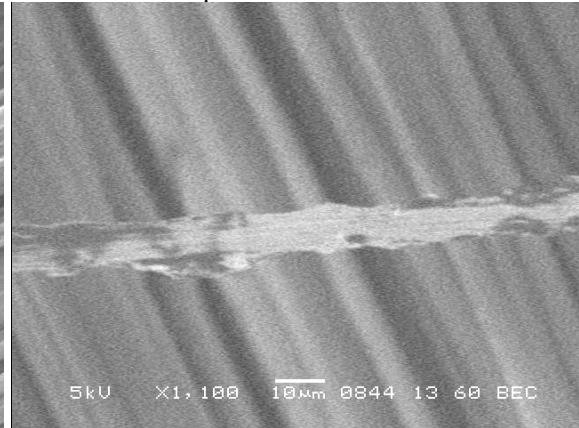
Inside the sputter coater.



A test run on the sputter coater.



SEM image of a coated sample.



A single coated fiber close up.

I have made progress and the project is coming along nicely. As of writing this (Spring 2007) the project is at a stage where I am continuing work out some bugs and making modifications to the sputter coater to optimize it. That's how it is when forging into unknown scientific territory: you start with a good idea and solve lots of smaller problems along the way to making the big idea happen.

The scope of the project grew and it has made an impact at Evergreen in ways I could not have foreseen. The Clean Energy Committee asked that I do some educational outreach through the project, but left it up to me to choose how that would come about. I began to take tours of prospective Evergreen students through the lab to explain the project and give them a glimpse of undergraduate research at Evergreen. Eventually current evergreen students took the tour as well. This was rewarding for me. I want people to know what can be done to help save our environment. Greeners are a force for positive change in the world. With the opportunities that Evergreen offers for students there is no limit to what we can accomplish.

Thank you so much, Chanin King
For more on this project go to

<http://fuelcellguy.zaadz.com/blog> <http://fuelcellguy.zaadz.com/photos>