

## **The University of Waterloo: A Pioneer in Nanotechnology Education**

**Alicia Burns, Engineering Village:** Shirley, thank you so much for agreeing to speak with us here at Engineering Village. Can you tell us a little bit about your role at Waterloo?

**Professor Shirley Tang:** I joined Waterloo in 2006. To give you a little bit of background, here in Waterloo, we have an undergraduate nanotechnology program, and also a research institute called the Waterloo Institute of Nanotechnology.

I joined Waterloo in the department of chemistry, and also the Waterloo Institute of Nanotechnology. My role is to teach in the undergraduate nanotechnology program and also to do nanotechnology research.

**Alicia Burns, Engineering Village:** What prompted the university to create the nanotechnology program?

**Professor Shirley Tang:** This is a very unique program. I was not here when it was established, but I have heard a lot of good stories about it. People always say that the idea started with a bunch of professors who then put together a program where students are enrolled into a coherent course of study. They don't have to run between different departments, or only take one or two nanotechnology electives in their fourth year, like at other universities.

This program has strong funding, with a dedicated building facility and also dedicated faculty. We're currently hiring 21 new faculty members. From year one to year four, students participate in a complete nano-engineering program. So, they are quite unique and very capable.

The other thing that I can say is that they're much more advanced in terms of nanotechnology-oriented laboratory, and the projects that they're doing. The symposium is a good example of this.

**Alicia Burns, Engineering Village:** And what exactly is the symposium?

**Professor Shirley Tang:** This class is the first nano-engineering class that reached the fourth year. So, basically, at the beginning of their fourth year, they started this project. And it lasted two terms. They started from scratch, and divided into three to four students per group to carry out the project.

The symposium tomorrow is to present these projects. They're going to have oral presentations and also posters detailing the project they have completed during the last two terms.

**Alicia Burns, Engineering Village:** And what types of projects will be represented at the symposium?

**Professor Shirley Tang:** The titles all have "nano" in them, but it's really looking to electronics, photonics and bio-applications where nano materials can give improvement in terms of performance.

There are sixteen projects in three areas. One area is photonics and electronics. The second is nanofluidics and nano bio-applications, and the third area is nanomaterials. So, these are leading-edge research projects, forcing the frontier in terms of research and applications.

**Alicia Burns, Engineering Village:** And I know you have some students with you. Could they please identify themselves? They are the team that did the night vision stealth coating project, right?

**Professor Shirley Tang:** Right.

**Mickey Chan, Waterloo Senior:** I'm Mickey Chan, Waterloo Senior.

**Vanessa Ng, Waterloo Senior:** I'm Vanessa Ng, Waterloo Senior.

**Sandy Liu, Waterloo Senior:** I'm Sandy Liu, Waterloo Senior.

**Ernest Ho, Waterloo Senior:** And I'm Ernest Ho, Waterloo Senior.

**Mickey Chan, Waterloo Senior:** And we're all fourth-year nanotechnology engineering program students.

**Alicia Burns, Engineering Village:** And can you explain your project in layman's terms for us?

**Ernest Ho, Waterloo Senior:** Well, our project is pretty simple, but it's the application that we're targeting that makes it innovative. Basically, we want to take some of the properties of carbon nanotubes, and form a carbon nanotube coating, so that it can be coated onto different fabric substrates.

And, our design is based on the fact that carbon nanotubes have a wide absorption spectrum, meaning that it can absorb different types of radiation. So, in theory, it can absorb the emitted infrared radiation from the human body, which is what makes it applicable for stealth applications, in order to be camouflaging against night vision devices.

**Alicia Burns, Engineering Village:** And what prompted the idea for this project?

**Vanessa Ng, Waterloo Senior:** Basically, like Ernest was saying about the very unique properties of carbon nanotubes, we learned about this in class, and we thought that it was a really interesting material to work with. And since we knew that Professor Tang was doing research using carbon nanotubes, we brought some ideas to her, and we had a discussion with her.

But she also brought some of her own ideas. And this was one of her ideas, and we really liked it. So, we decided to pursue this for our project.

**Professor Shirley Tang:** We got the inspiration from Harry Potter's invisible cloak.

**Alicia Burns, Engineering Village:** Did you use any Elsevier products during the course of your research?

**Mickey Chan, Waterloo Senior:** Yes, we did. We actually used Elsevier online tools to look up research articles during our research and design process. And since carbon nanotube is a new field, there is a lot of research going on, and we found a lot of useful information that we used as references.

**Alicia Burns, Engineering Village:** And do you anticipate any applications beyond your primary target?

**Sandy Liu, Waterloo Senior:** CNTs not only have good optical properties, they also have very good electrical properties. So we think by incorporating carbon nanotubes in the fabrics, we can also utilize it as a wearable electronics application.

**Alicia Burns, Engineering Village:** Great. And, I have to ask, since you're the first class that's really finishing the nanotechnology program, what was your impression over the course of the program, as the first students to participate?

**Vanessa Ng, Waterloo Senior:** With any new program, there are always some rough patches, but I think that we've learned a lot from this program, and we've had some great opportunities at

Waterloo. They offer some things a lot of other universities don't. There's a lot of interesting research going on in different fields. And we've been able to just get a taste for practically all the fields right now. So, I think it's really good.

**Alicia Burns, Engineering Village:** Well, thank you all so much for your time. And good luck tomorrow at the symposium.

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