

## Research Project Uses Tea to Create 'Electroless' Water Filter for Developing Countries

Before he began his 3<sup>rd</sup> Class year at VMI, Garrett Briggs '18 had already learned an important lesson: in science, as in life, "When life hands you lemons, make lemonade."

In mid-May, Briggs was about to begin his Summer Undergraduate Research Program project designing a water filter that can give results in the field in real time. There was just one problem – some chemicals that his faculty mentor, Maj. Kyle Bantz, had ordered hadn't come in yet and the month-long summer session was passing fast.

Looking at the published literature, Bantz and Briggs found that tea – the kind sold in an ordinary grocery store – might be a workable substitute for the missing chemicals.

"We had to look somewhere else for methods, and that's how we found the tea bath," said Briggs, a chemistry major doing his first independent work in a lab. "We tried that, and it worked pretty well, surprisingly, so we've gone on from there."

Briggs has been electroplating water filters with a silver salt to make the filters more sensitive. Then, a process known as

surface-enhanced Raman spectroscopy is used to determine how much of a given molecule is present in a sample of water. The caffeine and organic materials in the tea make the silver stick to the water filter better, said Bantz, assistant professor of chemistry.

"We kind of use the tea to catalyze everything," she explained.

Briggs said that he'd tried several kinds of tea, including decaffeinated tea, but quickly found that caffeine is necessary. Coffee, though, didn't work as well, so it was discarded. Briggs found himself enjoying the learning process occasioned by the unexpected snag in his research plans.

"I really enjoy how fluid research is," said Briggs. "You can make a plan, and have goals, but you've got to be flexible. You'll have things missing, and you'll have things not work, and you need to be able to adapt and move on from that and still get results."



Water filter samples have silver deposited on their surfaces from various silver salt/tea bath combinations. – VMI Photo by John Robertson IV.

An environmental chemist, Bantz came to teach at VMI in the fall of 2014 after earning her doctorate at the University of Minnesota. Growing up in Wisconsin, near the Great Lakes, she developed an ongoing interest in water quality issues. Her goal for the water filter project is to create a product that could be used on

site in the developing world.

"The whole purpose of doing this with electroless [for which electricity is not needed] plating is to make this out in the field," Bantz explained. "Could we use this for villages that need their water tested?"

Bantz plans to keep the water filter project going through at least next summer. She and Briggs have tested the filter using clean water, but in the fall Bantz hopes to test water from the Maury River and then later test water that's pre-contaminated with bacteria.

"There's always steps between proving this works and ... proving that it's stable," she noted.

– By Mary Price



Garrett Briggs uses the Raman spectrometer under the direction of Maj. Kyle Bantz to determine if the filter has a good sensor surface. – VMI Photo by John Robertson IV.