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The Combat Capabilities Development Command (DEVCOM) Chemical Biological Center, formerly known as the U.S. Army Edgewood Chemical Biological Center, is the Army's principal research and development center for chemical and biological defense technology, engineering and field operations. The headquarters of the DEVCOM Chemical Biological Center is located at the Edgewood Area of Aberdeen Proving Ground, Maryland.

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DEVCOM CBC Makerspace Used for Detection Capability

By Jerilyn Coleman

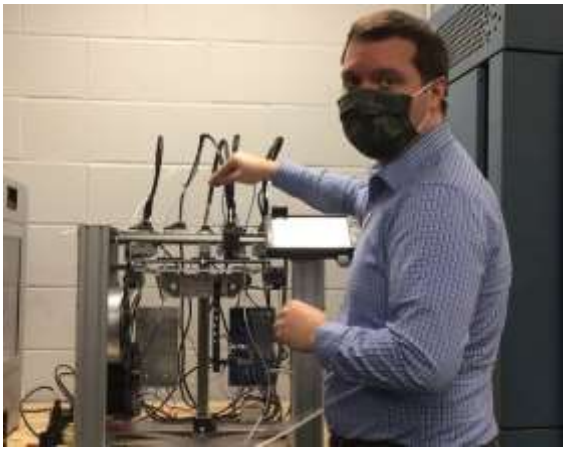
Research chemist Dr. Brian Hauck and Chemical Biological Center Makerspace manager Bradley Ruprecht conduct research to create chemical vapor detector components using 3D printing.

Aberdeen Proving Ground, MD -- Researchers at the U.S. Army Combat Capabilities Development Command Chemical Biological Center (DEVCOM CBC) are leveraging the CBC Makerspace for additive and advanced manufacturing to produce chemical vapor detector components using 3D printing.

Dr. Brian Hauck, a research chemist with the Center's Research and Technology Directorate, sought help from the Center's Makerspace hub and connected with Bradley Ruprecht, CBC Makerspace manager and an engineering technician with the Center's Rapid Technologies Laboratory, to jumpstart his work. The detector component effort was previously resourced internally and is currently funded by the Defense Logistics Agency and the Defense Threat Reduction Agency.

For five years, the CBC Makerspace has been a resource for Center personnel to get training, consultation and tools needed for their research. The Makerspace includes capabilities ranging from 3D scanning and printing, machine laser cutting, metal bending, engineering services and more. "There's a good investment here. We have a Center that decided to invest in this, make it work and make it accessible," Ruprecht said. "We have a good formula and business plan. That's why it works for us. It's a unique capability and asset."

Hauck's effort focuses on 3D printed ion drift tubes. Ion drift tubes are a critical component of chemical vapor detectors that are based on ion mobility spectrometry (IMS). IMS is an analytical technique used to identify threats, such as chemical agents and explosives, based on their vapor signatures. An example of an IMS-based device currently used by warfighters is the M4A1 Joint Chemical Agent Detector, a handheld device that sounds an alarm if a chemical vapor threat is present in the air.



Dr. Brian Hauck demonstrates how ion drift tubes would be created using 3D printing.

The technology is found in other settings as well. In an airport, a TSA agent takes a wipe sample of luggage and inserts that wipe into a box. According to Hauck, the box is an IMS-based detector, which vaporizes the solid residue collected from the luggage, ionizes it and checks it for explosive or harmful chemical agents.

“Detection is a huge part of CBC and a lot of what we do deals with new and novel sensors and new materials for sensors,” Ruprecht said. “So, working on an IMS drift tube to go with the JCAD just makes sense. It fits with the Army’s mission and within the CBC mission.”

This effort will be advantageous to the warfighter because it would make the next generation of IMS-based detectors easier and cheaper to replicate, as well as more accessible in the field. Hauck’s team imagines that if a detector part is lost or damaged in the field during a mission, Soldiers could use a 3D printer in the field to print a new part or even a new detector.

Currently, this project is in the applied research phase. Hauck and Ruprecht are working to ensure that additive manufacturing can create functional complex components of the detector and that it is a means of construction that won't sacrifice accuracy. In the next couple of years, the goal is to create a detector that can be printed and assembled on site with minimal training and expertise. “Our expected next steps are to be able to fully 3D print an actual detector, or to at least print components that are easily swappable if you have a broken detector that needs to be fixed,” Hauck noted.

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