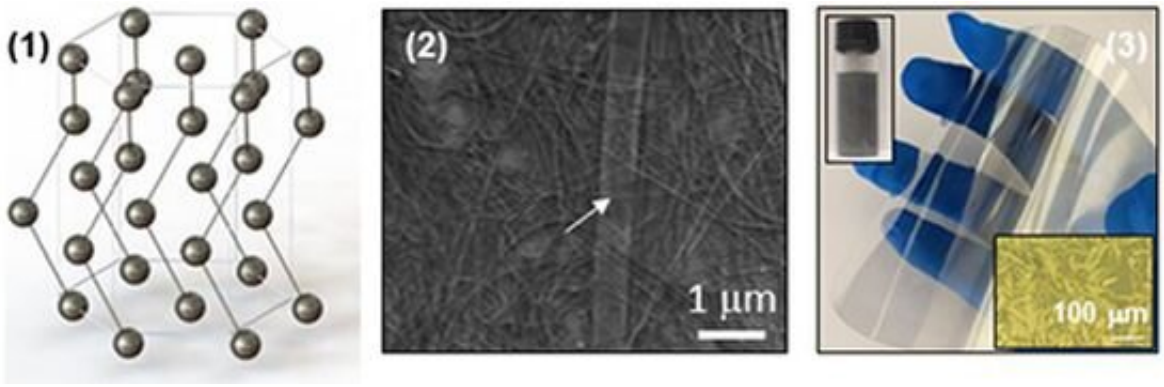
2-D nanomaterial shows promise for high-speed electronics, quantum devices and defense tools

September 2 2020, by Chris Adam



A Purdue University team received a U.S. patent for a nanomaterial derived from the rare element tellurium, which has a thin, durable structure with unique properties. Credit: Purdue University

Purdue University researchers have passed another significant milestone as they work to take a new two-dimensional nanomaterial to market for use in nanoelectronics, quantum devices and infrared technology used in national defense tools and biochemical sensors.

The Purdue team received a U.S. patent for the nanomaterial, derived from the rare element tellurium, which has a thin, durable structure with unique properties.

"Purdue is the birthplace of this new material," said Wenzhuo Wu, Purdue's Ravi and Eleanor Talwar Rising Star Assistant Professor of Industrial Engineering, who led the team. "Our technology produces atomically thin 2-D tellurium, which can be used for high-performance devices. The amount needed for each device is very little, and the added values can be enormous."

Tellurium is not abundant on the Earth's crust, but Wu said only a tiny amount is needed to be synthesized through their solution method. Wu said the Purdue nanomaterial, called tellurene, is air-stable and can grow on its own without the help of another substance.

"Recent advances have led to new electronic and photonic device paradigms leveraging 2-D materials, which have an atomically thin thickness, but their length and width are much larger than that thickness," Wu said. "Our solution helps overcome roadblocks for known 2-D materials to meet the technological needs in emerging areas such as nanoelectronics or mid-infrared integrated photonics."

Tellurene has several potential applications, including high-speed electronics, wearable sensors, quantum devices and infrared technology.

Wu said he and the students discovered their solution by accident while they were conducting routine experiments in the laboratory. Since their discovery of tellurene, Wu and his team have published over a dozen papers on the intriguing properties and device applications of tellurene for nanoelectronics, infrared sensors, photonic devices and other technologies.

The team worked with the Purdue Research Foundation Office of Technology Commercialization to patent the technology.

Provided by Purdue University