Expanded ion beams light new way for next-generation electronic devices, energy storage, smart homes

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A device from Purdue University researchers may light a new way for next-generation electronic devices, energy storage and smart homes. Credit: Stock

A new type of lens is lighting the way for expanded uses of large ions and building blocks for new materials. The lens may also address one of the fundamental bottlenecks for generating bright ion beams.

A Purdue University analytical chemistry group has developed a new device to help generate intense beams of large ions, which can be used for the fabrication of energy storage devices, optical coatings, purification of proteins and metabolites from complex biological samples, and nanoclusters from reaction mixtures.

"We have developed a lens that merges and focuses up to 20 ion beams," said Julia Laskin, the William F. and Patty J. Miller Professor of Analytical Chemistry in Purdue's College of Science. "This opens the door for the creation of next-generation electronic, energy and other smart devices."

The multichannel electrostatic elliptical lens developed at Purdue has a precisely defined electrical field. It forces multiple ion beams to change their velocity directions and merges them into one intense beam of ions with well-defined composition and kinetic energy.

The lens technology is based on the concept of ion soft landing, which was developed at Purdue by R. Graham Cooks, the Henry B. Hass Distinguished Professor of Analytical Chemistry. With the development of bright ion sources, ion soft landing will become a practical approach for doping materials and preparing ultrathin coatings to enhance the performance of devices and develop new materials.

"We are building this unique approach to materials preparation to create the future for molecular 3-D printing using ion beams," Laskin said. "We are helping to overcome the challenge that current state-of-the-art devices have with lacking the ability to merge multiple ion beams. In a way, it's like we are bringing together these major highways into one usable roadway."

Provided by Purdue University