The Strathclyde research group is leading efforts to take advantage of plasmons to make up for the shortcomings of the universe, to make the significant scientific breakthrough. The work is that of the ALPS-5.7 (Advanced Lasers-Based Accelerators to towards X-rays) project, led by Professor Diarmuid Jassonczyk of Strathclyde. Professor Jassonczyk is the first to create a coherent X-ray-source.

Jassonczyk said: "Plasmas are completely broken down matter, which is separated into positively charged ions and free electrons and can be used in laser-based accelerators."

This new research builds on the earlier pioneering results of the ALPS-5.7 project, in which lead-phosphorus doped and antimony-doped germanium were used to accelerate electrons to high energies, much in the same way as a gutter gathers momentum from a snowfall and eventually overflows the gutter.

One of the challenges faced by Jassonczyk and his team was to measure the duration of the very brief electron bunches from the laser wakefield accelerator. By passing the electron bunch through an ultra-thin aluminum foil, and measuring the spectrum of the light emitted from the foil as the electron bunch passed through it, they established that the electron bunch duration was much shorter than initially expected. The light emitted from the foil is known as Cold Transition Radiation, which is emitted when electrons in the foil are kicked by the electrostatic field of the electron bunch as they pass by.

Researchers discover zombie solar cells

A group of researchers at Uppsala University has discovered a zombie solar cell that can generate electricity with unexpected effectiveness although the liquid transferring charges between the electrodes has dried out.

The discovery was made by Gertrud Bischl’s group at the Department of Chemistry-Augment laboratory, Division of Physical Chemistry. When the researchers tested old silicon-sensitized solar cells, also known as Grätzel cells, these were still active, despite the fact that the electrolyte conducting electricity between the minus and plus poles had evaporated, geoJournal.net reported.

The lead-sulfur solar cells worked in some cases even better than when they were liquid-filled and alive. The power converter efficiency of specific cells had increased by eight percent, which is a record for dye-sensitized solar cells with a solid hole conductor. One post-doc Maria Fristad who produced and studied the solar cells said: "The solar cells remained working in some cases even better than when they were liquid-filled and alive."

This is a significant advantage compared to traditional, shorter-wave-length laser.

A team of Camille Brits at EPLF showed a way to design these lasers at a lower cost, by changing the way optical fibers are connected to each other. Thanks to the new configuration, they are able not only to produce very good two-micron lasers, but also to do without an expensive and complex component of the traditional camcorder system.

This two-micron spectral domain has potential applications in medicine, environmental sciences and industry. At these wave-lengths, the laser light is easily absorbed by water molecules, which are the main constituents of human tissue.

Lasers with a wavelength of two microns could move the boundaries of surgery and mole-detection. Researchers at Ecole Polytechnique Fédérale de Lausanne (EPFL) in Switzerland, have managed to generate such lasers using a simple and inexpensive method.

In recent years, two-micron lasers (0.002 millimeters) have been of growing interest among researchers. In the areas of surgery and mole-detection, for example, they offer significant advantages compared to traditional, shorter-wave-length lasers.

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The researchers found that the surface of strontium titanate, a material called "hard carbon" that can be used as high-capacity, low-cost electrodes for sodium-ion (Na-ion) batteries.

"Haithal algal blooms, caused by cyanobacteria (or so-called "blue-green algae"), severely threaten humans, livestock, and wildlife, leading to illness and sometimes even death. Dr. Da Deng, lead author and professor at Wayne State University in Detroit, told Phys.org.

As Deng explained, Na-ion battery technology is still in its infancy compared to Li-ion batteries. One of the challenges in developing Na-ion batteries is to find a reliable electrode material. While graphite is often used in the electrodes of Li-ion batteries, the larger Na-ions do not fit as well into the graphite structure as the smaller Li-ions do. Instead, Na-ions fit better into hard carbon, which is more disordered than graphite and contains a greater number of large defects and voids that can store the larger Na-ions. This study is the first time that Haithal (specifically blue-green algae) have been directly converted into carbon for Na-ion batteries. Haithal batteries have advantages in that they grow quickly and don’t require land or soil. And as the researchers showed here, Haithal can easily be converted into hard carbon by simple heat treatment, without the need for purification or other additional processing.

After heating the algae, the researchers made the electrodes out of a mixture of 80 percent hard carbon derived from algae, 10 percent carbon black (to enhance conductivity) and 10 percent binder. After drying this slurry overnight, they assembled it into coin cells with sodium foil as the counter electrode. Tests showed that the electrode started out with a high capacity of up to 440 milliamps-hours per gram (mAh/g), but suffered from an irreversible capacity loss after the first cycle, bringing the charge capacity down to about 230 mAh/g. The electrodes then had good capacity retention from the second cycle onward.

A team of scientists from the University of Chicago and the Pennsylvania State University have accidentally discovered a new way of using light to draw and erase quantum-mechanical circuits in an ion. The breakthrough could lead to novel materials that could be used to make computers that are much more powerful and efficient than those made from conventional accelerators, curvechucks.com said.

"It’s one of those rare moments in experimental science when a seemingly random event — turning on the room lights — generated unexpected effects with potential important impacts in science and technology," said Awschalom and his colleagues found that by intentionally focusing beams of light on their samples, they could drive electronic structures that persisted long after the light was removed.

Two-micron lasers are also very useful for detecting key meteorological data over long distances through the air. Not to mention that they are highly effective in the processing of various industrial materials.

To create a two-micron fiber-laser, light is usually imported into an optical fiber-ring containing a gain region which amplifies two-micron light. The light circulates in the ring, passing through the gain region many times thus gaining more and more power, until becoming a laser. For optimal operation, these systems include a costly component called isolator, which forces the light to circulate in a single direction.

At PHOSL, researchers built a thulium-doped fiber laser that works without an isolator. Their idea was to connect the fiber-diffraction grating instead of isolator. "We plug in a kind of deviation that reflects the light traveling in the wrong direction, putting it back on track," said Camilla Brits.

This means no more need for the isolator, whose job is to stop light moving in the wrong direction, sort of like a traffic cop. "We replaced the traffic cop with a detour," said Svyatoslav Kharitonov, the lead author.

The bunches were produced by focusing a high-power laser with a wavelength of two microns on graphitized carbon and strontium titanate (STO). These materials have a length that is one 300th of the breadth of a hair and transmit light in the two-micron region much faster than those produced from conventional accelerators, curvechucks.com said.