Researchers recreate photosynthesis to power devices

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Nature has perfected the art of using the Sun to fuel growth. A team of international researchers looked into what is needed to recreate the process artificially. The results could have various uses, from an alternative to petrol to ultradense computer memories or highly efficient solar cells.

Artificial photosynthesis would make it possible to produce fuels from sunlight - to charge biological materials and transfer energy. And while traditional sources of energy are dwindling, solar energy is abundant. Harvesting it to produce fuel would provide an alternative energy source.

Molecular electronics was at the heart of the BIMORE ('Bio-inspired

Molecular Optoelectronics) project - using molecular building blocks to power electronic components. The goal is to reduce electronics to the scale of a single molecule. At this scale, materials have very different properties, which need to be understood before they can be exploited. And BIMORE has increased this understanding.

The team grew light-harvesting purple bacteria, which was then studied using femtosecond spectroscopy - the equivalent to taking many photographs very quickly. This allowed the researchers to see at which point light energy hops from one group of bacteria to another. They could also see when the light energy reaches the 'reaction centre', where light energy is converted into biochemical energy.

Observing the whole process showed how energy transfer could be managed to optimise efficiency in optoelectronics - the branch of technology combining electricity and light, and encompassing solar cells and sensors.

The team also created an antenna able to capture light in the same way that an antenna would capture a radio signal. The antenna uses two gold tips, separated by a nanoscale gap - no wider than a hundred-thousandth of the width of a human hair. The tips grab the light and concentrate it down into a tiny space, increasing light intensity.

While the ability to charge molecules opens up new opportunities, the ability to switch them on an off would be even more valuable. With this in mind, the team was able to develop a light-emitting transistor (LET) covered with a layer of photochromic molecules (those that change colour when exposed to a particular light) displaying promising switching properties.

More information: www.umbodsmadur.de/bimore/index.html

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