PANELES SOLARES

06/06/2014

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Nano Werk

http://www.nanowerk.com/nanotechnology-news/newsid=35807.php

Vie, 30 de may de 2014 00:00

Audiencia: 33.520 **Ranking:** 5

VPE: 835 **Página:** 1

Tipología: online

The quantum mechanisms of organic devices for alternative solar panels are revealed

Viernes, 30 de mayo de 2014

(Nanowerk News) Silicon panel-based technology requires a very costly, contaminating manufacturing process, while organic photovoltaic (OPV) devices have been positioned as one of the most attractive alternatives as a source of solar energy.

This research has made a ground-breaking discovery because it is the first time that the quantum mechanisms that trigger the photovoltaic function of these devices have been deciphered. Angel Rubio, Professor of Condensed Matter Physics at the Faculty of Chemistry of the UPV/EHU-University of the Basque Country, director of the Nano-Bio Spectroscopy Group, and associate researcher of the Donostia International Physics Center (DIPC), has participated in the research conducted in this field in collaboration with various centres in Germany, Italy and France. The research is being published in the prestigious journal Science ("Coherent ultrafast charge transfer in an organic photovoltaic blend").

simulation of the evolution in the transfer of charge from the polymer to the fullerene in femtoseconds

Photos of the simulation of the evolution in the transfer of charge from the polymer to the fullerene in femtoseconds

These organic devices use a photosensitive polymer linked to a carbon nanostructure that functions as a current collector. When light falls on the device, the polymer traps the particles of light and induces the ultrafast transmission of electrons to the nanostructure through an electron impulse in the order of femtoseconds (fs), in other words, 10-15 seconds. Evidence was recently found to confirm this ultrafast transfer, but the research of Rubio and his team has gone a step further because it has succeeded in deciphering the element mechanism that unleashes the electron transfer between the polymer and the nanostructure. The first-principal simulations in a simplified model predicted that the coherent vibrations are the ones that dictate the periodic transfer of charge between the polymer and the fullerene.

The group involved in the experiment confirmed this prediction by studying the optical response of a common material comprising a polymer and a by-product of the fullerene (a conventional nanostructure with a spherical shape) by means of high-resolution temporal spectroscopy.

The results confirmed that the coupling of the vibrations of the polymer and the fullerene bring about the electron transfer in a coherent and ultrafast way (∼23 fs), without any need to accept incoherent processes that are manifested in slower transfers (100 fs). These studies demonstrate the critical role played by quantum coherence in organic photovoltaic devices.

The research offers a vision that is consistent with element quantum processes in organic photovoltaic devices and constitutes a significant step forward in this field. This research opens up the means for a substantial and

controlled improvement in organic devices for photovoltaic applications, pointed out Prof Ángel Rubio.
Source: University of the Basque Country

Read more: The quantum mechanisms of organic devices for alternative solar panels are revealed http://www.nanowerk.com/nanotechnology-news/newsid=35807.php#ixzz33r0ETHQg
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Vie, 30 de may de 2014 00:00
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European physicists create simulation (note: it's visually quite interesting) and measure coherent oscillations in organic solar-cell material

Viernes, 30 de mayo de 2014

A team of physicists from a number of universities and institutes in Germany, Italy, France, and Spain has experimentally confirmed a coherent oscillation of light received in a particular type of organic photovoltaic cell containing fullerenes (carbon-based "buckyballs") and conjugated polymers.1

Using high-resolution temporal spectroscopy, the European team has confirmed that the energy oscillates coherently between the fullerene and the polymer, measuring a 25-fs period (the coherent period) rather than a longer 100-fs period corresponding to incoherent transfer.

Homebuilt spectrometer
The researchers constructed their own ultrabroadband pump-probe spectrometer with a resolution of better than 15 fs; built around a regeneratively amplified mode-locked Ti:sapphire laser producing 150-fs pulses at a 1 kHz repetition rate, the system drives two independent non-collinear optical parametric amplifiers (NOPAs), one producing sub-10-fs pump pulses at a 540 nm wavelength, and the other producing 15-fs probe pulses in the near-IR that are frequency-doubled to 460 nm.

A series of sophisticated quantum-dynamics simulations created by the researchers provides impressive movies of the evolution of the electronic cloud and of the atomic nuclei in this system, which are responsible for the oscillations found in the experiments. "Our calculations indicate that the coupling between electrons and nuclei is of crucial importance for the charge transfer efficiency," says Elisa Molinari of the Istituto Nanoscienze of CNR and the University of Modena and Reggio Emili, who, along with Carlo A. Rozzi, Istituto Nanoscienze CNR, created the simulations. "Tailoring this coupling by varying the device morphology and composition hence may be important for optimizing device efficiency."
Frames in a simulation show the oscillating transfer of charge back and forth from a conjugated polymer (the molecular chain) to a fullerene (the ball-shaped molecule) in femtoseconds. The polymer/fullerene-based system has just been excited by light; the two parts of the system, separated by a small space, act as the poles of a nanoscopic sun-operated battery. Each frame depicts a scene about 2 nm wide. (Credit: Carlo A. Rozzi, Istituto Nanoscienze CNR)

Will the new results immediately lead to better solar cells? "Such ultrafast spectroscopic studies, and in particular their comparison with advanced theoretical modelling, provide impressive and most direct insight in the fundamental phenomena that initiate the organic photovoltaic process. They turn out to be very similar to the strategies developed by nature in photosynthesis," says Christoph Lienau, a physics professor from the University of Oldenburg who led the research team. "Recent studies indicate that quantum coherence apparently plays an important role in that case. Our new results provide evidence for similar phenomena in functional artificial photovoltaic devices: a conceptual advancement which could be used to guide the design of future artificial light-harvesting systems in an attempt to match the yet unrivaled efficiency of natural ones."

The team included members from Carl von Ossietzky Universität (Oldenburg, Germany), Istituto Nanoscienze Consiglio Nazionale delle Ricerche (CNR; Modena, Italy), Istituto di Fotonica e Nanotecnologie CNR (Milano, Italy), University of Konstanz (Konstanz, Germany), CNRS, Universitè Paris-Sud (Orsay, France), UPV/EHU-University of the Basque Country (San Sebastián, Spain), Fritz-Haber-Institut der Max-Planck-Gesellschaft (Berlin, Germany), and Università di Modena e Reggio Emilia (Modena, Italy).

Sources: http://www.alphagalileo.org/ViewItem.aspx?ItemId=142345&CultureCode=en and http://www.eurekalert.org/pub_releases/2014-05/in-c-frt053014.php

The quantum mechanisms of organic devices for alternative solar panels are revealed

Viernes, 30 de mayo de 2014

University of the Basque Country Silicon panel-based technology requires a very costly, contaminating manufacturing process, while organic photovoltaic (OPV) devices have been positioned as one of the most attractive alternatives as a source of solar energy. This research has made a ground-breaking discovery because it is the first time that the quantum mechanisms that trigger the photovoltaic function of these devices have been deciphered. Angel Rubio, Professor of Condensed Matter Physics at the Faculty of Chemistry of the UPV/EHU-University of the Basque Country, director of the Nano-Bio Spectroscopy Group, and associate researcher of the Donostia International Physics Center (DIPC), has participated in the research conducted in this field in collaboration with various centres in Germany, Italy and France. The research is being published in the prestigious journal Science. These organic devices use a photosensitive polymer linked to a carbon nanostructure that functions as a current collector. When light falls on the device, the polymer traps the particles of light and induces the ultrafast transmission of electrons to the nanostructure through an electron impulse in the order of femtoseconds (fs), in other words, 10-15 seconds. Evidence was recently found to confirm this ultrafast transfer, but the research of Rubio and his team has gone a step further because it has succeeded in deciphering the element mechanism that unleashes the electron transfer between the polymer and the nanostructure. The first-principal simulations in a simplified model predicted that the coherent vibrations are the ones that dictate the periodic transfer of charge between the polymer and the fullerene. The group involved in the experiment confirmed this prediction by studying the optical response of a common material comprising a polymer and a by-product of the fullerene (a conventional nanostructure with a spherical shape) by means of high-resolution temporal spectroscopy. The results confirmed that the coupling of the vibrations of the polymer and the fullerene bring about the electron transfer in a coherent and ultrafast way (23 fs), without any need to accept incoherent processes that are manifested in slower transfers (100 fs). These studies demonstrate the critical role played by quantum coherence in organic photovoltaic devices. The research, due to be published this week in the prestigious journal Science, offers a vision that is consistent with element quantum processes in organic photovoltaic devices and constitutes a significant step forward in this field. This research opens up the means for a substantial and controlled improvement in organic devices for photovoltaic applications, pointed out Prof Ángel Rubio. Full bibliographic informationS. Maria Falke, C.A. Rozzi, D. Brida, M. Amato, A. De Sio, A. Rubio, G. Cerullo, E. Molinari, C. Lienau. Coherent ultrafast charge transfer in an organic photovoltaic blend. Science 30 May 2014: Vol. 344 no. 6187 pp. 1001-1005 DOI: 10.1126/science.1249771

Science Daily
http://www.sciencedaily.com/releases/2014/05/140530121701.htm
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Audiencia: 1.143.035 **Ranking:** 7
VPE: 6.927 **Página:** 1
Tipología: online

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The quantum mechanisms of organic devices for alternative solar panels are revealed

Domingo, 1 de junio de 2014

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About University of the Basque Country
The University of the Basque Country is the largest Higher Education Institution in the Basque Country. It is a public, all-inclusive establishment structured in 3 campuses (corresponding to the 3 historical territories of the region) and counts 31 faculties and schools. A total 45,000 students take courses leading to one of our 70 Bachelor´s Degrees or 150 postgraduate programmes. Up to 70 % of all research projects carried out in the Basque Country are developed within our institution. Our constant promotion of age-old Basque language has made it possible for almost all courses to be offered in both official languages (Spanish and Basque), and we are furthermore introducing a number of courses taught in English and French. The Euskampus project, probably the most ambitious our University has ever implemented, was deemed Campus of International Excellence in 2010; the University of the Basque Country aims to become one of the leading European Universities.

ELE Times
http://www.eletimes.com/technology-news/quantum-mechanism-of-opv-paves-the-new-path-for-solar-panels/
Lun, 2 de jun de 2014 00:00
Audiencia: 628 **Ranking:** 3
VPE: 1 **Página:** 1
Tipología: online

Quantum Mechanism of OPV paves path for solar panels

Lunes, 2 de junio de 2014

The first time that the quantum mechanism triggers the photovoltaic function of these devices have been deciphered. Angel Rubio, Professor of Condensed Matter Physics at the Faculty of Chemistry of the UPV/EHU-University of the Basque Country, director of the Nano-Bio Spectroscopy Group, and associate researcher of the Donostia International Physics Center (DIPC), has participated in the research conducted in this field in collaboration with various centres in Germany, Italy and France. These organic devices use a photosensitive polymer linked to a carbon nanostructure that functions as a current collector. When light falls on the device, the polymer traps the particles of light and persuade the ultrafast transmission of electrons to the nanostructure through an electron impulse in the order of femtoseconds (fs), in other words, 10-15 seconds. Confirmation was recently found of this ultrafast transfer, but the research of Rubio and his team has gone a step further because it has succeeded in deciphering the element mechanism that unleashes the electron transfer between the polymer and the nanostructure. The first-principal simulations in a simplified model predicted that the coherent vibrations are the ones that dictate the periodic transfer of charge between the polymer and the fullerene. The group incorporated in the experiment confirmed this prediction by studying the optical response of a common material comprising a polymer and a by-product of the fullerene (a conventional nanostructure with a spherical shape) by means of high-resolution temporal spectroscopy. The results confirmed that the coupling of the vibrations of the polymer and the fullerene bring about the electron transfer in a coherent and ultrafast way (≈23 fs), without any need to accept incoherent processes that are manifested in slower transfers (100 fs). These studies demonstrate the critical role played by quantum coherence in organic photovoltaic devices.

Research Highlights Quantum Mechanics of OPV Devices

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Audiencia: 3.352 **Ranking:** 4

VPE: 7 **Página:** 1

Tipología: online

Organic Devices for Alternative Solar Panels

Miércoles, 4 de junio de 2014

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