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International Conference on

ADVANCED MATERIALS AND POLYMER SCIENCE

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International Conference and Expo on

SEPARATION TECHNIQUES

October 19-20, 2018 | Tokyo, Japan

DAY 1

Keynote Forum

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Md Akhtaruzzaman, Mater Sci Nanotechnol 2018, Volume 2

Md Akhtaruzzaman

Universiti Kebangsaan Malaysia, Malaysia

Biography

Md Akhtaruzzaman is an Assoc Professor at the Solar Energy Research Institute of The National University of Malaysia (Universiti Kebangsaan Malaysia), where he is leading the organic-inorganic hybrid solar cells unit at solar photovoltaics group. After received his BSc in 1996 and MSc in 1998 in Applied Chemistry and Chemical Engineering from The University of Dhaka, he has been awarded the Japanese Government's Monbukagakusho scholarship and joined at the Institute for Molecular Science in Okazaki, Japan where he obtained his PhD in March 2003. Thereafter, he worked in Japan for 12 years (Tokyo Institute of Technology, Fujifilm Fine Chemicals Co. Ltd., and Tohoku University), King Saud University in Saudi Arabia and University of Malaya (UM) in Malaysia. He has published over 70 papers, reviews in peer- reviewed journals, and patents, and book chapters.

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MOLECULAR ENGINEERING AND PROSPECTS OF ORGANIC DYES FOR DYE-SENSITIZED SOLAR CELLS (DSSC)

The dye-sensitized solar cells (DSCs) have gained popularity due to their ease of fabrication, light weight, and capability for being processed in ambient conditions. Although significant research has focused on the improvement of DSSC performance, chemists, materials scientists and engineers still face many challenges for practical realization of DSSCs in real world application. Typically, a DSSC consists of a photoanode composed of a dye monolayer adsorbed on mesoporous semiconductor oxide coated on a transparent conducting substrate, an electrolyte and a counter electrode. The dye plays a crucial role in designing efficient DSSCs as it should capture as much incident light as possible by optimization of the absorption strength (molar extinction coefficient) and overlap of the absorption with the solar spectrum (i.e., the absorption spectral width). Simultaneously, the dye should inject the photo generated electron into the semiconductor oxide. Until now, the dyes (organic/metal complexes) in use have strong absorption in the UV-visible region with power conversion efficiency (PCE) up to 13%. However, there have been a few individual dyes identified that have panchromatic light harvesting ability in near-infrared (NIR) region with the PCE <7%. So, the alternative approach to capture the light over a wide range of absorption spectra by co-sensitization using multiple dyes has been studied and verified with increased light harvesting properties. Co-sensitization of multiple organic dyes which contain maximum absorption in sensitive smaller parts of the visible region of 300-850nm is probable. The high molar extinction coefficients, easy structural modification and facile synthesis process of metal free organic sensitizers make them ideal candidates for designing co-sensitized DSSCs. Different type of sensitizers and co-adsorbents have been designed, synthesized and analyzed so far. This phenomenon will successfully enhance the efficiency of a DSSC and create new pathways to obtain custom molecular engineered DSSC for real life applications.

Note:

Chiba S, Mater Sci Nanotechnol 2018, Volume 2

Chiba S

Chiba Science Institute, Japan

Biography

Chiba S was Executive Director for Advanced R&D Project Development, SRI International. He served on SRI for 22 years. He was supervising advanced R&D programs including Japanese Government projects. Currently, he is CEO and Professor, Chiba Science Institute. He has published more than 367 papers in the various areas and has been serving as Editorial Board Member of AWMC, Industrial Engineering and Management, Industrial Engineering and Management, Steel Structures and Construction, and Journal of Material Science. He has a PhD in Metallurgy and Material Science from the University of Wales.

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ELECTROACTIVE POLYMER TRANSDUCERS

Electroactive polymer transducers have many features that are desirable for various devices. An especially attractive type of electroactive polymer is dielectric elastomer (DE). DEs are a new type of transducer technology that were first investigated by SRI International in 1991. DE has a very simple structure comprised of a polymer film (elastomer) sandwiched between two electrodes made of a flexible and elastic material. Applying a voltage difference between the two electrodes causes a compression in the horizontal direction and a stretching along the surface. As elastomers are light and deform like rubbers, they can show flexible movements like bionic actions. They can express "flexible and natural feeling" which systems with motors cannot imitate. In addition to above, DE actuators do not use any gears and cams, thus enabling high efficiency and safe and smooth driving even if the speed or direction of movement are suddenly changed. Using DE elements, a variety of devices can easily be made, such as linear actuators, diaphragm actuators for fluid pumps, and actuator arrays. Its low cost, light weight, softness, high efficiency, and quietness make the actuator suitable for robots, motors, speakers, and smart materials. The DE actuator has a fast speed of response (over 100,000 Hz has been demonstrated for small strains), with a high strain rate (up to 600%). Our recent progress is a DE actuator having only 0.1 g of DE that lifted a weight of 22N using single CNT electrodes. This is suitable for the hands or feet of robots. We also developed a ribbon form DE actuator having a sensor function that can be used to measure force, or pressure, as well as motion at the same time. This actuator can assist human and robot motions. At the same time, it can work as a motion feedback sensor. We hope that it may be useful for smart rehabilitation equipment for hands, legs, and fingers. DE has also been shown to operate in reverse as a generator. Experiments have been performed on portable DE generators powered by human motion, ocean wave power harvesters mounted on buoys, solar heat generators, and water turbines. The power output levels of such demonstration devices are small now. However, the performance of these devices has supported the potential benefits. We are starting to develop elastomers having larger dielectric constant to produce a "super artificial muscle for excellent sensors, powerful energy harvesting devices, and DE motors can drive vehicles.

Note:

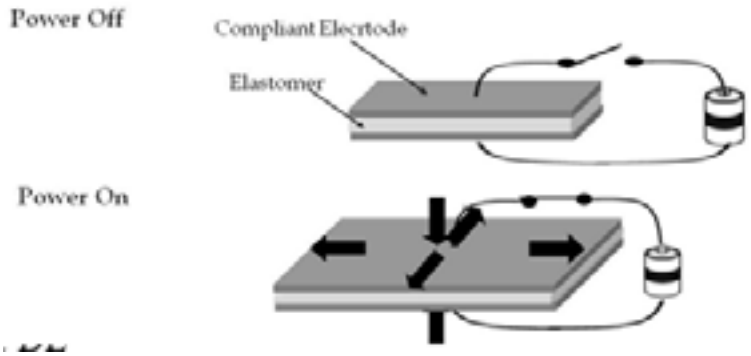

Fig.1: Principle of operation of DE actuators.

Recent Publications

1. S Chiba et al (2016). Elastomer Transducers (2016). Advances in Science and Technology. Trans Tech Publication, Switzerland. 97: 61-74.
2. Chiba S et al (2017). Experimental study on the motion of floating bodies arranged in series for wave power generation. Journal of Material Science and Engineering A7. 11-12: 281-289.
3. Chiba S et al (2017). Simple and robust direct drive water power generation system using dielectric elastomers. Journal of Material Science and Engineering B7. 1-2: 39-47.

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Monica Butnariu

Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Romania

Biography

Monica Butnariu has completed her PhD in 2005 (Banat University, RO), since 2013 is habilitated doctor/Cluj-Napoca University, RO. She is the Professor of University of Agricultural Sciences and Veterinary Medicine of Banat "King Mihai I of Romania" in Timisoara, Romania. She has been serving as an editorial board member of journals and she has peer review activity. So far, she has written several books/book chapters in different areas of Chemistry. She received Romanian Academy Award for chapter Chemical Composition of vegetables and their products in book handbook of food chemistry.

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EXTRACTION OF ESSENTIAL OILS FROM MEDICINAL PLANTS

In antiquity and the middle ages for the extraction of essential oils the method of extraction with animal fats was used, although the history of the orient mention's knowledge by the Arabs of hydro distillation extraction method. In the epochs that marked the beginnings of civilization and epoch modern, the only method, the majority used was the hydro distillation method with water vapor, which is still used today. In the last years, extraction was attempted essential oils with microwave. The method of microwave extraction of essential oils is also a method of hydrodynamics but heating of the medicinal plants/processing mass uses microwave pumping which results in rapid and simultaneous heating. That is, a temperature gradient that is propagating from the inside to the outside of the processing mass is very fast, due to the water molecules existing in the processed medicinal plants. Water is a microwave absorber over other materials, that allow microwaves to pass without absorbing their energy. The non-absorbent material is used to build processing facilities in microwave extraction facilities. The absorption of water from the microwave by water is since water molecules in the electric field of microwave train are electrical dipoles that vibrate with the frequency of incident microwaves. In this situation, water dipoles collide with the molecules of the substances that make up the essential oils, resulting in heat, and thus transform the electromagnetic energy of the microwaves into thermal energy, used for the extraction with water of the essential oils of the medicinal plants.

Note: