高分子学会九州支部外国人講演会のご案内

この度、池谷コンファレンスに招待講演のため Dr. Adam Pron（CEA, Grenoble, France），Prof. Nguyen Duc Nghia and Dr. Ngo Trinh Tung (*Academy of Science and Technology (VAST), Hanoi, Vietnam)* 以上三氏が来日されます。この機会に九州工業大学ひびきのキャンパスにお招きし、下記の通り講演会を開催することになりました。皆様には万障お繰り合わせの上、ご来聴くださいますようご案内申し上げます。

記

1. 講演会テーマ：新規導電性高分子の合成と電子デバイスへの応用に関する国際コロキューム

2. 日時：2008 年 10 月 24 日（金）　14：00－17：00

3.場所：九州工業大学大学院生命体工学研究科　２階端末演習室２

4. プログラム

14:00-14:45 Prof. Nguyen Duc Nghia
Recent Research and Development of Nanochemistry in Vietnam Academy of Science and Technology (VAST)

14:45-15:30 Dr. Ngo Trinh Tung
Preparation of conducting polymer by chemical vapor deposition method and its application in Fabrication of Light Emitting Diode (LED)

15:45-16:45 Dr. Adam Pron
Molecular composites of functionalized polythiophenes and semiconductor nanocrystals: synthesis, spectroscopic, electrochemical and photovoltaic properties

16:45-17:30 Prof. Wataru Takashima
Unique functionality in electrochemical actuator consisted of conducting polymers

以上

18:00 – 20:00
Mixer with snacks and drinks

Organizer,
Prof. Keiichi Kaneto
LSSE, Kyushu Institute of Technology,
Kaneto@life.kyutech.ac.jp, watakashi@life.kyutech.ac.jp

Recent Research and Development of Nanochemistry in Vietnam Academy of Science and Technology (VAST)

Prof. Nguyen Duc Nghia

In this presentation, firstly a short review of VAST as well as the Institute of Chemistry and their main research activity are introduced. In the second part, some results on the research of nano-structured conducting polymer and polymer nanocomposite are presented. The researches are concentrating on the two polymer system-PANi/Clay and PANi/Fe_2O_3.NiO. Detail of the preparation processes and the properties of PANi/clay and PANi/Fe_2O_3.NiO polymer nanocomposite have been reported and discussed. Besides, the preparation of silver nanoparticle and its application have been also investigated. Some effects of the kind of the reducer and surfactant on the formation of silver nanoparticles are discussed.

Preparation of conducting polymer by chemical vapor deposition method and its application in Fabrication of Light Emitting Diode (LED)

Dr. Ngo Trinh Tung

It was demonstrated that poly(p-phenylenevinylene) (PPV) and the its copolymers consisting of p-phenylenevinylene (PV) and p-phenyleneethylene (PE) units could be prepared by the chemical vapor deposition (CVD) method. It is interesting to note that the copolymer was synthesized from a single monomer, p-(methoxymethyl)benzyl chloride via the CVD method method. The composition of the copolymers can be varied by altering the monomer activation temperature; the higher the temperature, the lower the content of the PV units becomes. The sufficient incorporation of the PE units into the poly(p-phenylenevinylene) backbone caused a significant blue shift in both photoluminescence and electroluminescence. The luminescence properties of the copolymer strongly depend on the amount of the PE units incorporated. The external quantum efficiency of the electroluminescence devices having the configuration of ITO/PEDOT-PSS/copolymer/Al-Li increased as the content of the PV units increased in the copolymer, which can be ascribed to the improved confinent of excitons.

Molecular composites of functionalized polythiophenes and semiconductor nanocrystals: Synthesis, Spectroscopic, Electrochemical and Photovoltaic properties

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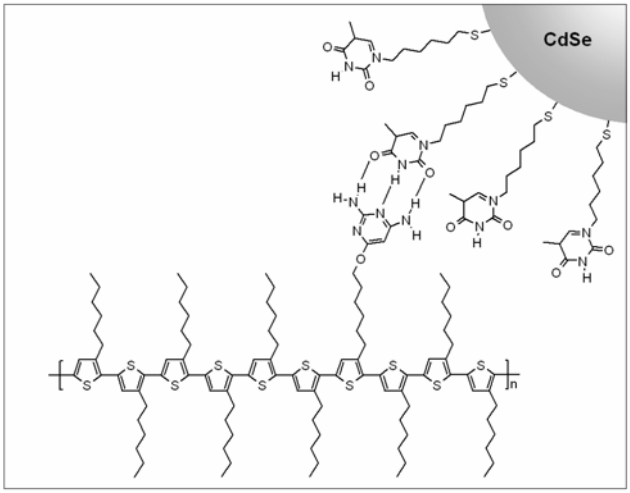
Composites of semiconductor nanocrystals and conjugated polymers constitute a new class of inorganic/organic materials with a large variety of potential applications in hybrid electronics and electrochemical devices. However the processing of these materials is difficult because of a strong tendency of both components to phase separate. We report, for the first time, the molecular recognition assisted processing of these composites. To assure this molecular level processing, regioregular poly(hexylthiophene) was functionalized with diaminopyrimidine and monodisperse CdSe nanocrystals of few nm size were complexed with mercaptohexylthymine. The molecular recognition between both composite components was assured by three complementary hydrogen bonds as schematically depicted below.



The applied processing strategy is very general and can be applied in different modifications (casting, layer by layer (LbL) deposition etc) yielding materials of different morphologies: composites with uniform distribution of nanocrystals, gradient composites, interpenetrating network-type composites, multilayered composites and others. Detailed spectroscopic, electrochemical and spectroelectrochemical investigations show that strong interactions between the composite components modify their HOMO and LUMO levels, however their alignment remains appropriate for several molecular electronics applications, including photovoltaic cells.

Unique functionality in electrochemical actuator consisted of conducting polymers

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Mechanical functionality has recently been developed in conducting polymers. Electrochemical soft actuator is the most hot-topic utilizing for this functionality. There still exist several unique phenomena, which will follow clarifying mechanisms of the actuation in those electroactive films.

Loading effect on electroactive film was found to modulate their redox activity as well as their actuation. This is a sort of feedback functionality for electrochemical soft actuator. We demonstrated that the load application to the film modified the CV characteristics. The load causes an ad-hoc stretching of the film, by which Yong's modulus along to the load may temporary increase, resulting to reduce the actuation response.

Mechanically induced current, a phenomenological counterpart of electrochemical actuation, was observed in polypyrrole (PPy) films. The induced current was found to well correlate both to the load intensity and to the concentration of mobile ion in PPy films. A two-electrode type device was fabricated and demonstrated in its load sensing functionality. Increase of surface polarity as well as introducing electrolyte having high diffusion coefficient clearly increased the current magnitude. This can be utilized as a force sensor and as a power generation film.

Actuation response was also investigated as a function of the frequency of sinusoidal electrochemical potential. It was found that both of the stroke magnitude as well as the phase delay (tan δ) of electrochemical actuation displays a clear dispersion at the same frequency zone. This represents the electrochemical actuation is one of the viscoelastic response of the polymer film as a function of electrochemical stimuli, which will open a new frontier.