KYOTO UNIVERSITY
Global COE Program
INTEGRATED
MATERIALS SCIENCE

グローバル COE 特別連続講演会

「分光学と表面科学の最近の進展」

この講演会の目的は、分光学、物理化学、表面科学、生物物理などに関係する３つの講演に興味を持つ研究者が一堂に会する場所を設けて、学際的な討論の場を提供しようというものです。広い分野の研究者、学生が参加してくれることを希望します。

世話人: 熊崎茂一

期日　時間,　２０１０年１１月　１７日 (水曜日),　13:25 – 17:00

場所 : 京都大学理学研究科セミナーハウス (京都大学　吉田キャンパス　北部構内)
地図はこちら（http://www.sci.kyoto-u.ac.jp/modules/tinycontent9/index.php?id=1）

参加登録 :　無料です。ただし、事前に世話人まで「参加します」というメールを下されば助かります。

13:25 –opening remark

13:30 – 14:40

"Imaging the Femtosecond Time Scale Correlated Electron-Nuclear Dynamics in Surface Photodesorption"

Prof. Hrvoje Petek

Department of Physics and Astronomy, University of Pittsburgh

We employ time-resolved two-photon photoemission to characterize electronic structure and photoinduced dynamics of chemisorbed alkali atoms on noble metal surfaces. Photoinduced charge transfer excitation of the lowest energy sigma resonance of Cs on Cu or Ag surfaces turns on repulsive forces between atom and surface initiating nuclear wave packet motion on a dissociative potential energy surface. Energy, momentum, and time resolved measurements of photoemission from desorbing atoms provide information on the nuclear wave packet motion and the concomitant changes in the surface electronic structure. In particular, we use time-dependent momentum imaging of photoemission from the excited state to explore the correlation between the electron and nuclear motions.

金属表面に化学吸着したアルカリ原子が光励起によって表面から解離していく時の原子核の運動をフェムト秒の時間分解能で詳しく知ると同時に、原子核の運動と共に引き起こされる表面電子状態の変化も得るという非常に精密で先端的な表面科学のご研究です。

14:40 – 14:50 break

14:50 – 16:00

“Amyloid Fiber Formation and Inhibition Studied with 2D IR Spectroscopy”

Prof. Martin Zanni

Department of Chemistry, University of Wisconsin

Among the tools available to structural biologists, 2D IR spectroscopy has a unique combination of structure and time-resolution. With this technique, it is possible to probe structural changes with bond-specificity and femtosecond accuracy. This talk will present recent results on applying the technique to study the aggregation of the amyloid polypeptide implicated in type 2 diabetes. In conjunction with isotope labeling, transient 2D IR spectra have been collected that reveals a detailed pathway of the peptide backbone as it forms toxic oligomers and fibrils. Moreover, we have studied the action of a peptide inhibitor, and learned that it prevents fiber formation by binding to one of the two beta-sheets, which occurs about half-way along the aggregation pathway. Together, the fiber growth and drug inhibition mechanisms are two of the most detailed structural studies performed so far on this toxic polypeptide.

2 次元赤外分光法(2D-IR)は分子構造を高い時間分解能（ピコ秒）で得ることができるために非常に注目されています。この講演では 2 型糖尿病に関係すると言われるアミロイドポリペプチドに関する研究を紹介していただきます。過渡的 2D-IR 測定により、有毒な構造を形成する際のペプチド骨格の変化が詳細に明らかになってきたようです。

16:00 – 16:10 break

16:10 – 16:50

“Hydrogen-Bond Engineering and Proton Dynamics in Real Space”

Prof. Hiroshi Okuyama

Department of Chemistry, Graduate School of Science, Kyoto University

Proton-relay reactions in a model hydrogen-bond system were induced and observed using a scanning tunneling microscope (STM). We assembled hydrogen-bonded "wires" consisting of a single water molecule and two or three hydroxyl groups on Cu(110) at low temperatures with the STM. Using these model systems, proton-relay reactions along the hydrogen-bond wires, i.e., H_2O-OH-OH(-OH) -> (OH-)OH-OH-H_2O, were studied in real space. The reactions are triggered by vibrational excitations of the molecular adsorbates by the tunneling electrons followed by sequential interconversions of covalent and hydrogen bonds, resulting in the "structural transfer" of a water molecule. The experimental findings are rationalized by ab initio calculations for adsorption geometry, active vibrational modes, and reaction pathway, in order to reach a detailed microscopic picture of the elementary processes.

走査型トンネル顕微鏡より、低温の金属表面で水分子を含んだ水素結合のネットワークを形成させることができ、さらにトンネル電流の影響による分子振動励起によって水素結合と共有結合の組み換えが起こる様子を空間分解して観察することが可能となってきました。

16:50 –very brief closing remark.

ご注意： 飲み物、名札などは用意いたしません。

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