

Séminaire SOLEIL

Monitoring Plasmon-Assisted Photochemical Reaction at Metal Nanogap by Surface-Enhanced Raman Scattering

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Invité par Pascale ROY

**Lundi 20 juin à 14h00
Grand Amphi SOLEIL**

Séminaires

Localized electromagnetic field induced by photo-illumination at a vicinity of plasmon active metal nano-structure can be considered as the exotic perturbation to modify/change photo-excitation and/or polarization process of molecules locates close to the metal surface. The field may give us a chance for photo-chemical/physical manipulation of a single molecule at ultra-small space. In the present study, an isolated single-walled carbon nanotube with a diameter smaller than 1.5 nm was used as the target molecule. Carbon nanomaterials such as graphene sheet, nanohorns and carbon nanotube have been widely studying to develop a wide variety of applications due to their unique structural, optical and electronic characteristics. Especially carbon nanotube has attracted attention, because introduction of structural defect and hetero-atom doping into the structure can control local electronic state resulting in the development of novel catalytic property such as oxygen reduction reaction. To create novel catalyst based on the control of the structure in an atomic scale, plasmon-assisted photochemical reaction should be applied. We have succeeded in the fabrication of optimized metal nano-dimer arrays for obtaining intense local surface plasmon and consequently surface-enhanced Raman scattering (SERS). In the present study, SERS measurement was employed for investigating the electronic and defect characteristics of an individual single-walled carbon nanotube (SWNT) at metal nano-gap under electrochemical potential control.

Our results demonstrate that the observation of intermediate frequency modes serves to identify defects as well as catalytic activity monitoring. Electrochemical potential dependence of the single radial breathing mode was also observed. Based on the model of electron doping / undoping on individual single-walled carbon nanotube, the absolute potential of the Fermi level of an individual SWNT can be evaluated.

These results demonstrated that SERS measurements enable to probe and create the local defect and electronic properties of an individual SWNT at the metal nano-gap.

Reference : H. Nabika, M. Takase, F. Nagasawa, and K. Murakoshi, "Toward Plasmon-Induced Photoexcitation of Molecules", *J. Phys. Chem. Lett. (Perspective)*, **1 (16)**, 2470–2487 (2010).

**Ce séminaire sera suivi d'une pause-café**

Formalités d'entrée : accès libre dans l'amphi du Pavillon d'Accueil. Si la manifestation a lieu dans le Grand Amphi Soleil du Bâtiment Central, merci de vous munir d'une pièce d'identité (à échanger à l'accueil contre un badge d'accès).

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