

### A Wide-View Parallax-Free Eye-Mark Recorder with a Hyperboloidal Half-Silvered Mirror and Appearance-Based Gaze Estimation

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*IEEE Transactions on Visualization and Computer Graphics*, 17, 900-912(2011)

We propose a wide-view parallax-free eye-mark recorder with a hyperboloidal half-silvered mirror and a gaze estimation method suitable for the device. Our eye-mark recorder provides a wide field-of-view video recording of the user's exact view by positioning the focal point of the mirror at the user's viewpoint. The vertical and horizontal angles of view of the prototype are 122 and 116 degrees, respectively. In our appearance-based gaze estimation method, we apply principal component analysis (PCA) and multiple regression analysis (MRA) to determine the relationship between the captured images and their corresponding gaze points. Experimental

results verify that our method estimates gaze direction with an angular accuracy of around 2 to 4 degrees.



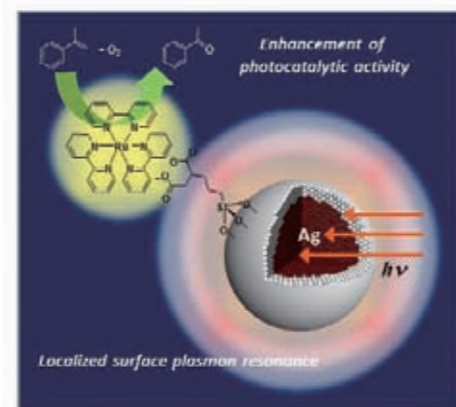
### Enhancement of the Photoinduced Oxidation Activity of Ru(II) Complex Anchored onto Silica-Coated Silver Nanoparticles by the Assist of Localized Surface Plasmon

Mori, K.; Kawashima, M.; Che, M.; Yamashita, H.

(Graduate School of Engineering)

*Angewandte Chemie International Edition*, 49, 8598-8601 (2010)

We have proposed a new class of nano-sized photocatalysts composed of core-shell Ag@SiO<sub>2</sub> nanoparticles with an anchored Ru(bpy)<sub>3</sub><sup>2+</sup> dye. The enhanced electromagnetic field in the vicinity of the Ag NPs (NPs) due to the localized surface plasmon resonance (LSPR) significantly enhances emission intensity of the dye, which ultimately results in the enhancement of catalytic activity for the photooxidation reaction using O<sub>2</sub>. This work provides a novel pathway to the design of new photocatalysts enabling selective organic transformation even under visible light irradiation.



### Arylimidovanadium(V) Complexes for a Tridendritic Centrosymmetric Structural Motif or Axial Chirality

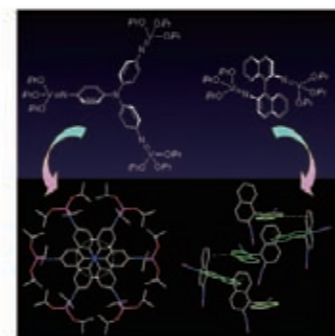
Moriuchi, T.; Nishina, M.; Hirao, T.

(Graduate School of Engineering)

*Angewandte Chemie International Edition*, 49, 83-86 (2010)

A one-pot versatile preparation of (arylimido)vanadium(V) triisopropoxides from the corresponding aniline derivatives and VO(OiPr)<sub>3</sub> was achieved by using NaH as a base. The one-pot preparation was demonstrated to design the trinuclear (arylimido)vanadium(V) triisopropoxide with a tridendritic centrosymmetric structural motif and the binuclear (arylimido)vanadium(V) triisopropoxide with axial chirality. Noteworthy feature of the multinuclear (arylimido)vanadium(V) triisopropoxides is their strong tendency to self-assemble through CH-π interaction to create a unique highly ordered molecular arrangement in a solid state. The present architecturally dimensional structures utilizing self-assembling properties of

(arylimido)vanadium(V) complexes are considered to be a useful approach to artificial organized nanostructures.



### Differential Importance of Trehalose Accumulation in *Saccharomyces cerevisiae* in Response to Various Environmental Stresses.

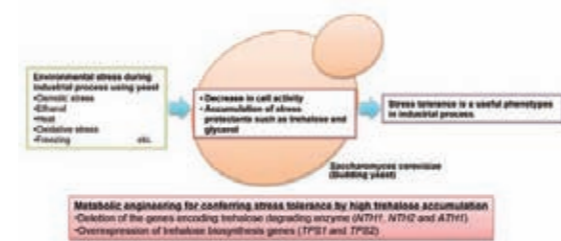
Mahmud, S. A.; Hirasawa, T.; Shimizu, H.

(Graduate School of Information Science and Technology)

*Journal of Bioscience and Bioengineering*, 109, 262-266 (2010)

In industrial processes using the yeast *Saccharomyces cerevisiae*, cells encounter the various environmental stresses and accumulate protectants against the stresses such as trehalose and glycerol. In this study, effectiveness of high trehalose accumulation on conferring tolerance to various environmental stresses was investigated in *S. cerevisiae*, using deletion strains of the *NTH1*, *NTH2*, and *ATH1* genes encoding trehalases related to trehalose degradation and the triple trehalase deletion strains overexpressing

*TPS1* or *TPS2* encoding trehalose biosynthesis enzymes. Our results indicated that metabolic engineering for high trehalose accumulation can make yeast cells tolerant to multiple stresses, such as high ethanol concentration, heat, oxidative, and freezing stresses.



### Elastic Stiffness of L1<sub>0</sub> FePt Thin Film Studied by Picosecond Ultrasonics

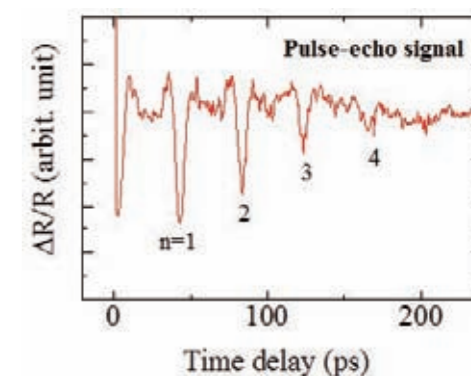
Nakamura, N.<sup>\*1</sup>; Uranishi, A.<sup>\*1</sup>; Wakita, M.<sup>\*1</sup>; Ogi, H.<sup>\*1</sup>; Hirao, M.<sup>\*1</sup>; Nishiyama, M.<sup>\*2</sup>

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*Applied Physics Letters*, 98, 101911 (2011)

Elastic constant is closely related with the interatomic potential of solid and is a fundamental parameter to be determined when a material is found or developed. L1<sub>0</sub> FePt is famous for the high uniaxial magnetic anisotropy, and has been intensively investigated. However, elastic constant has not been measured experimentally because of the difficulty of the fabricating a sufficiently larger single crystal specimen that the elastic constants can be accurately determined by conventional methods. In this study, we solved the difficulty in measurement by picosecond ultrasound, and determined elastic constants.



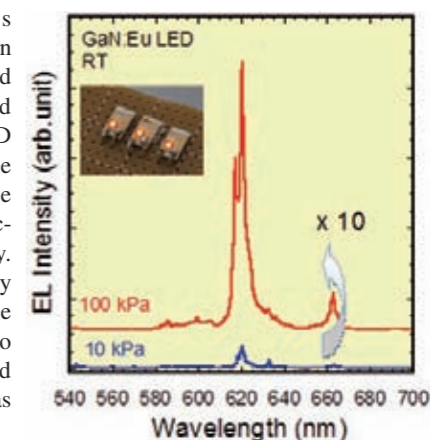
### Improved Luminescence Properties of Eu-Doped GaN Light-Emitting Diodes Grown by Atmospheric-Pressure Organometallic Vapor Phase Epitaxy

Nishikawa, A.; Furukawa, N.; Kawasaki, T.; Terai, Y.; Fujiwara, Y.

(Graduate School of Engineering)

*Applied Physics Letters*, 97, 051113/1-3 (2010)

GaN-based red light-emitting diodes (LEDs) are highly expected for fabrication of monolithic full-color LED displays and lightings. Recently, we have succeeded in the fabrication of GaN-based red LED by Eu doping into GaN. In this study, we demonstrated the improved luminescence properties of Eu-doped GaN by atmospheric-pressure organometallic vapor phase epitaxy. The integrated photoluminescence intensity became 10 times higher due to the more efficient energy transfer from the GaN host to Eu ions. As a result, we obtained the improved light output power of GaN-based red LED as high as 17 μW.



### Conformational Plasticity of RNA for Target Recognition as Revealed by the 2.15 Å Crystal Structure of a Human IgG-aptamer Complex

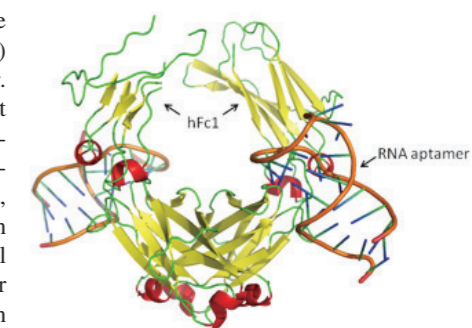
Nomura, Y.; Sugiyama, S.; Sakamoto, T.; Miyakawa, S.; Adachi, H.; Takano, K.; Murakami, S.; Inoue, T.; Mori, Y.; Nakamura, Y.; Matsumura, H.

(Graduate School of Engineering)

*Nucleic Acids Research*, 38(21), 7822-7829 (2010)

Aptamers are single-stranded nucleic acids with high affinity to target molecules and are applicable to therapeutics and diagnostics. In this paper, we describe the crystal structure of the Fc fragment of human IgG1 (hFc1) complexed with an anti-Fc RNA aptamer. The aptamer adopts a distorted structure fit to hFc1, and the aptamer-hFc1 interaction involves mainly van der Waals contacts and hydrogen bonds rather than electrostatic forces, in contrast to other known aptamer-protein complexes. We discovered that conformational plasticity and selectivity of an RNA aptamer is achieved by multiple interactions other than electrostatic forces, which is applicable to

many protein targets of low or no affinity to nucleic acids.



### Palladium-Catalyzed Coupling Reactions of Tetrafluoroethylene with Arylzinc Compounds

Ohashi, M.; Kambara, T.; Hatanaka, T.; Saijo, H.; Doi, R.; Ogoshi, S.

(Graduate School of Engineering)

*Journal of the American Chemical Society*, 133, 3256-3259 (2011)

Organofluorine compounds are widely used in all aspects of the chemical industry. Although tetrafluoroethylene (TFE) is an example of the economical bulk organofluorine feedstock, the use of TFE is mostly limited to the production of poly(tetrafluoroethylene) and co-polymers with other alkenes. We found that carbon-fluorine bond activation of TFE was achieved by the synergetic effects of the palladium(0) species and lithium iodide to generate the trifluorovinyl palladium(II) intermediate, and we developed the first example of the palladium-catalyzed coupling reaction of TFE with arylzinc reagents in the presence of lithium iodide, giving (α,β,β-trifluoro)styrene derivatives in excellent yield.

