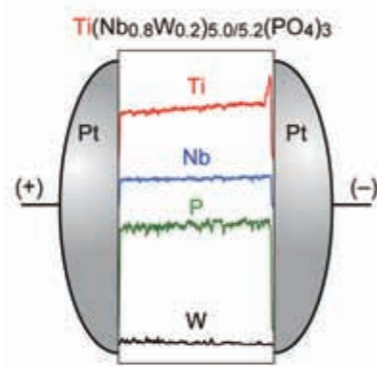


### First Discovery of Tetravalent Ti Ion Conduction in a Solid

Nunotani, N.; Tamura, S.; Imanaka, N.  
(Graduate School of Engineering)

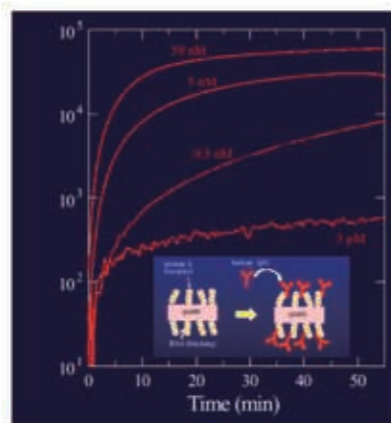
We have succeeded in developing a pure tetravalent  $Ti^{4+}$  ion conducting solid by designing the constituents of NASICON-type solid,  $TiNb(PO_4)_3$ . Although titanium cation has two kinds of valences of +3 and +4, implying the appearance of electronic conduction caused by the valence change, we have clarified that the  $Ti(Nb_{0.8}W_{0.2})_{5.0/5.2}(PO_4)_3$  solid in which the  $Nb^{5+}$  site was partially replaced by hexavalent  $W^{6+}$  ion was a pure  $Ti^{4+}$  ion conductor without showing any electronic conduction. The present study explicitly indicates that such a cation having multi valence state can be also a promising candidate for migrating ion species in solids by strictly selecting the crystal structure and its constituent ion species.



*Chemistry of Materials*, 21, 579-581 (2009)

### 170-MHz Electrodeless Quartz Crystal Microbalance Biosensor: Capability and Limitation of Higher Frequency Measurement

Ogi, H.<sup>\*1</sup>; Nagai, H.<sup>\*1</sup>; Fukunishi, Y.<sup>\*1</sup>;  
Hirao, M.<sup>\*1</sup>; Nishiyama, M.<sup>\*2</sup>  
<sup>\*1</sup>(Graduate School of Engineering Science)  
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Science Education and Technology)



We develop a highly sensitive quartz crystal microbalance (QCM) biosensor with a fundamental resonance frequency of 170 MHz. Its shear vibration is excited by the line wire, and the vibration signals are detected by the other line wire, achieving the noncontacting measurement of the resonance frequency. The mass sensitivity of the newly developed biosensor is better than that of a conventional QCM biosensor by three orders of magnitude. Its high sensitivity is demonstrated by detecting human immunoglobulin G via staphylococcus protein A immobilized nonspecifically on both surfaces of the quartz plate. The detection limit is 0.5 pM.

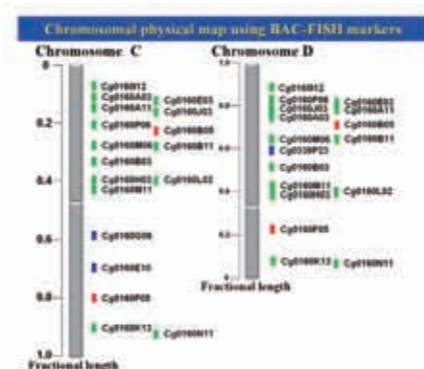
*Analytical Chemistry*, 81,  
8068-8073 (2009)

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### Bacterial artificial chromosome library for genome-wide analysis of Chinese hamster ovary cells

Omasa, T.; Cao, Y.; Park, J.Y.;  
Takagi, Y.; Kimura, S.; Yano, H.;  
Honda, K.; Asakawa, S.; Shimizu, N.;  
Ohtake, H.  
(Graduate School of Engineering)

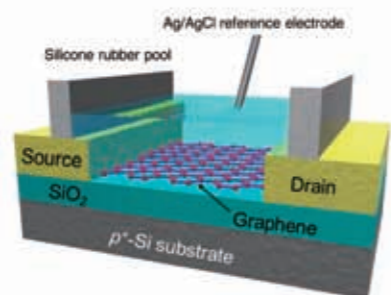
Chinese hamster ovary (CHO) cell lines are widely used for scientific research and biotechnology. A CHO genomic bacterial artificial chromosome (BAC) library was constructed from gene-amplified CHO DR1000L-4N cell line for genome-wide analysis of CHO cell lines. The library consisted of 122,281 clones and was expected to cover the entire CHO genome (approximately same size of human genome) five times. Our CHO BAC library have the potential to contribute to next generation cell engineering on the basis of our understanding of chromosome organization during the establishment of recombinant CHO cell lines.



*Biotechnology and Bioengineering*, 104,  
986-994 (2009)

### Electrolyte-Gated Graphene Field-Effect Transistors for Detecting pH and Protein Adsorption

Ohno, Y.; Maehashi, K.; Yamashiro, Y.;  
Matsumoto, K.  
(The Institute of Scientific and Industrial  
Research)

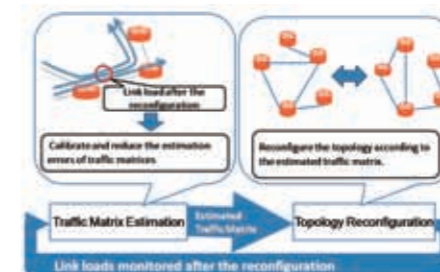


*Nano Letters*, 9, 3318-3322 (2009)

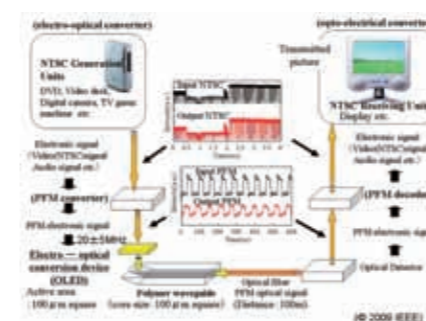
Graphene, single layer of two-dimensional hexagonal network of carbon atoms, have been intensively studied in recent years due to their extremely high carrier mobility ( $>20,000$   $cm^2/Vs$  at room temperature). We investigated electrolyte-gated graphene field-effect transistors (G-FETs) for electrical detecting pH and protein adsorptions. G-FETs immersed in an electrolyte showed transconductances 30 times higher than those in a vacuum and their conductances exhibited a direct linear increase with electrolyte pH, indicating their potential for use in pH sensor applications. We also attempted to direct surface-protein adsorption and showed that the conductance of G-FETs increased with exposure to a protein at several hundred pM.

Dynamic reconfiguration of the network topology is one efficient way to accommodate traffic that changes unpredictably. To reconfigure the network, traffic matrices, which indicates traffic volumes between all pairs of edge nodes, is required. However, it is difficult to monitor traffic matrices directly. This paper proposes a network reconfiguration method which cooperates with the estimation of traffic matrices. In this method, topology reconfiguration is divided into multiple stages. In each stage, we reconfigure the topology by using the estimated traffic matrices. Then, by using the link loads after the reconfiguration, we calibrate and reduce the estimation

errors of traffic matrices. By continuing the above steps, we can reduce estimation errors significantly and reconfigure the sufficient network topology at the end.



This paper describes the application of organic light-emitting diodes (OLEDs) and organic



photodetectors (OPDs) to integrated photonic devices for the realization of an all polymeric local area network (LAN). The fabrication and characteristics of OLEDs and OPDs fabricated by vacuum and solution process were reported. 100 MHz signals have been created by directly driving of OLEDs and 80 MHz signals have been received by OPDs. Clear video signals have been transmitted using vacuum and solution processed OLEDs, and successfully received by the OPDs. This study ascertained that organic devices are applicable to integrated photonic devices for optical local networks.

▲2009IEEE. Reprinted, with permission from Ohmori, Y. et al., Organic Devices for Integrated Photonics, *Proceedings of the IEEE*, 97, 1627-1636(2009).

### Gradually Reconfiguring Virtual Network Topologies Based on Estimated Traffic Matrices

Ohsita, Y.<sup>\*1,2</sup>; Miyamura, T.;  
Aarakawa, S.<sup>\*2</sup>; Ata, S.; Oki, E.;  
Shiomoto, K.; Murata, M.<sup>\*2</sup>  
<sup>\*1</sup>(Graduate School of Economics)  
<sup>\*2</sup>(Graduate School of Information  
Science and Technology)

*IEEE/ACM Transactions on Networking*,  
18, 177-189 (2010)

### Organic Devices for Integrated Photonics

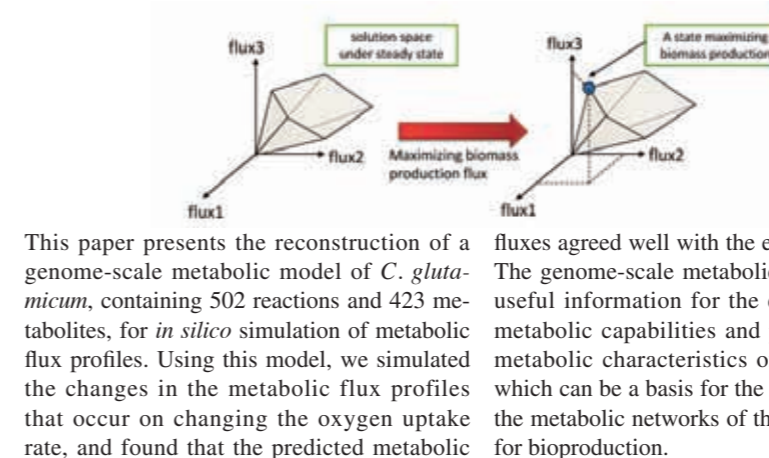
Ohmori, Y.; Kajii, H.  
(Center for Advanced Science and  
Innovation)

*Proceedings of the IEEE*, 97,  
1627-1636 (2009)

### Development and experimental verification of a genome-scale metabolic model for *Corynebacterium glutamicum*

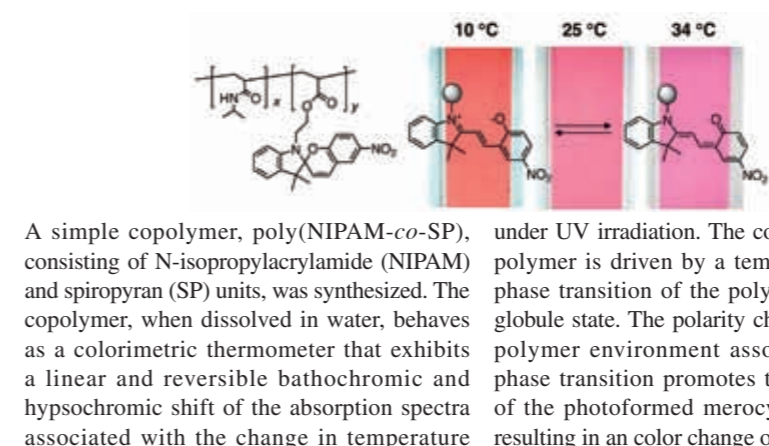
Shinfuku, Y.; Sorpitorn, N.;  
Furusawa, C.; Hirasawa, T.; Shimizu, H.  
(Graduate School of Information Science  
and Technology)

*Microbial Cell Factories*, 8, 43 (2009)



This paper presents the reconstruction of a genome-scale metabolic model of *C. glutamicum*, containing 502 reactions and 423 metabolites, for *in silico* simulation of metabolic flux profiles. Using this model, we simulated the changes in the metabolic flux profiles that occur on changing the oxygen uptake rate, and found that the predicted metabolic

fluxes agreed well with the experimental data. The genome-scale metabolic model provides useful information for the evaluation of the metabolic capabilities and prediction of the metabolic characteristics of *C. glutamicum*, which can be a basis for the rational design of the metabolic networks of this microorganism for bioproduction.



A simple copolymer, poly(NIPAM-co-SP), consisting of N-isopropylacrylamide (NIPAM) and spiropyran (SP) units, was synthesized. The copolymer, when dissolved in water, behaves as a colorimetric thermometer that exhibits a linear and reversible bathochromic and hypsochromic shift of the absorption spectra associated with the change in temperature

under UV irradiation. The color change of the polymer is driven by a temperature-induced phase transition of the polymer from coil to globule state. The polarity change of the inner polymer environment associated with this phase transition promotes the isomerization of the photoformed merocyanine fragment, resulting in a color change of the polymer.

### Spiropyran-Conjugated Thermoresponsive Copolymer as a Colorimetric Thermometer with Linear and Reversible Color Change

Shiraishi, Y.; Miyamoto, R.; Hirai, T.  
(Research Center for Solar Energy  
Chemistry)

*Organic Letters*, 11, 1571-1574 (2009)