

Aptamer-Based Label-Free Immunosensors Using Carbon Nanotube Field-Effect Transistors

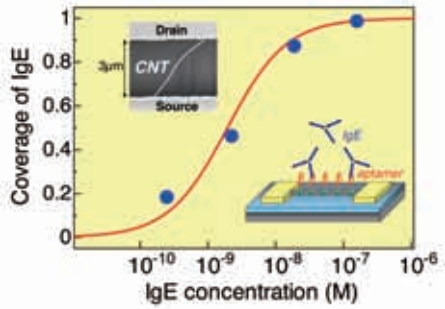
Maehashi, K.^{*1}; Matsumoto, K.^{*1}; Takamura, Y.; Tamiya, E.^{*2}

^{*1}(Institute of Scientific and Industrial Research)

^{*2}(Graduate School of Engineering)

Electroanalysis, 21, 1285 – 1290 (2009)

Aptamer-based label-free immunosensors were fabricated for immunoglobulin E (IgE)



detection using carbon nanotube field-effect transistors (CNTFETs). Aptamers are artificial oligonucleotides and thus are smaller than the Debye length. After aptamers were covalently immobilized on CNT channels, the electrical properties of the CNTFETs were monitored in real time. Introduction of IgE at various concentrations caused a sharp decrease in the source-drain current and gradual saturation at lower currents. From the measurement of the dependence of CNTFET electrical properties on IgE concentration, the dissociation constant between aptamer and IgE reactions was estimated to be 1.9×10⁻⁹ M using the Langmuir adsorption isotherm.

Quiescence of Self-stabilizing Gossiping among Mobile Agents in Graphs

Masuzawa, T.; Tixeuil, S.

(Graduate School of Information Science and Technology)

Quiescence Numbers of Self-stabilizing Gossiping among k Agents									
Agent ID	Distinct ID				No ID (Anonymous)				
	Synchronous		Asynchronous		Synchronous		Asynchronous		
Link duplex capacity	Full	Half	Full	Half	Full	Half	Full	Half	
Information on whiteboard	Full	k-1	Full	0	Full	≥0	Full	0	
	Gossip	≥0	Gossip	0	Gossip	≥0	Gossip	0	
	Control	k-1	Control	0	Control	Self-stabilizing solution is impossible	Control	0	
	No		No		No		No		Self-stabilizing solution is impossible

This paper considers gossiping among mobile agents in graphs: agents move on the graph and have to disseminate their initial information to every other agent. It focuses on self-stabilizing solutions for the gossip problem, where agents may start from arbitrary locations in arbitrary states. This paper formalizes the self-stabilizing agent gossip problem, introduces the quiescence

number as the maximum number of eventually stopping agents of self-stabilizing solutions (that inherently require some of the participating agents to keep moving forever) and investigates the quiescence number with respect to several assumptions related to agent anonymity, synchrony, link duplex capacity, and whiteboard capacity.

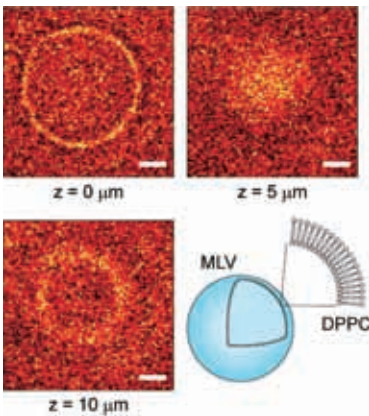
Multi-focus excitation coherent anti-Stokes Raman scattering (CARS) microscopy and its applications for real-time imaging

Minamikawa, T.^{*1}; Hashimoto, M.^{*1}; Fujita, K.^{*2}; Kawata, S.^{*2}; Araki T.^{*1}

^{*1}(Graduate School of Engineering Science)

^{*2}(Graduate School of Engineering)

We demonstrated real-time molecular imaging without staining by using multi-focus excitation coherent anti-Stokes Raman scattering (CARS) microscopy with a microlens array scanner. Parallel exposure of a specimen with light from two highly controlled picosecond mode-locked lasers (jitter of 30 fs, point-by-point wavelength scan within 300 ms) and parallel detection with an image sensor enabled real-time imaging. We realized real-time imaging of polystyrene beads (30 fps), a giant multi-lamellar vesicle (MLV) of DPPC lipids (10 fps), and living HeLa cells (10 fps).



Optics Express, 17, 9526-9536 (2009)

Automatic recognition of defect areas on a semiconductor wafer using multiple scanning electron microscope images

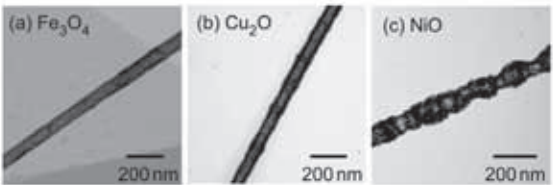
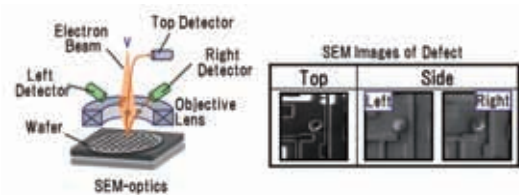
Nakagaki, R.; Honda, T.; Nakamae, K. (Graduate School of Information Science and Technology)

Measurement Science and Technology, 20, 075503 (2009)

This paper presents a technique for automatic recognition of defect areas on a semiconductor wafer using scanning electron microscope (SEM) images.

The technique inputs multiple SEM images formed by selectively detecting secondary electrons and backscattered electrons emitted from the specimen. The number of detected secondary electrons and backscattered electrons is highly dependent on the surface roughness of the defect areas; therefore, a surface-roughness analysis is

conducted to improve the accuracy of the recognition. The technique provides effective pre-processing for automating the classification of defects, and is expected to improve the efficacy of yield management in semiconductor device fabrication.



Oxide nanotube formation via the oxidation of Fe, Cu and Ni nanowires were studied by transmission electron microscopy. Oxide nanotubes with a cylindrical interior pore of uniform diameter were formed after the oxidation of Fe and Cu nanowires in air at 573 and 423 K, respectively, while the Ni nanowires became bamboo-like porous NiO with separate

interior voids at 673–773 K. The formation of these hollow structures can be explained by the rapid outward diffusion of metal ions through oxide layers and the assembly of excess vacancies. The irregular shape of NiO is attributed to the high mobility of vacancies in Ni during oxidation.

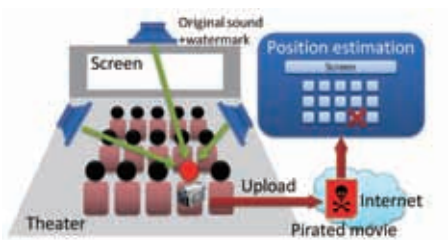
Formation of Oxide Nanotubes via Oxidation of Fe, Cu and Ni Nanowires and their Structural Stability: Difference in Formation and Shrinkage Behavior of Interior Pores

Nakamura, R.^{*1}; Matsubayashi, G.; Tsuchiya, H.^{*2}; Fujimoto, S.^{*2}; Nakajima, H.^{*1}

^{*1}(Institute of Scientific and Industrial Research)

^{*2}(Graduate School of Engineering)

Acta Materialia, 57, 5046-5052 (2009)



Movie piracy, illegally shooting movies in a theater with a camcorder, has become a serious problem which violates the intellectual property right of movie studios. To tackle this problem, we develop a system for estimating a pinpoint position of the camcorder from a watermarked soundtrack of pirated movies. This is the world's first application of an audio digital watermarking technique to pinpoint position estimation. The system is applicable without modifying any existing facilities of a theater where at least three loudspeakers are available. Experimental results for an actual theater show that the root mean squared error of estimates is 0.44 m.

Watermarked Movie Soundtrack Finds the Position of the Camcorder in a Theater

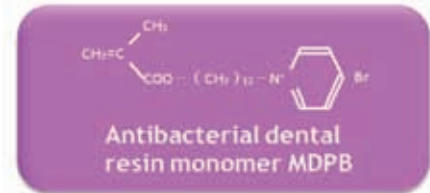
Nakashima, Y.; Tachibana, R.; Babaguchi, N.

(Graduate School of Engineering)

IEEE Transactions on Multimedia, 11 (3), 443-454 (2009)

This paper describes the influences of an antibacterial monomer 12-methacryloyloxydodecylpyridinium bromide (MDPB) on odontoblastic MDPC-23 cells, focusing on the possibility of new treatment modality to preserve infected pulp by an antibacterial dental adhesive containing MDPB. MDPB demonstrated lower inhibitory effects on the proliferation of odontoblastic cells than Bis-GMA, a resin monomer frequently used for dental adhesives. While MDPB affected the differentiation of odontoblastic cells, negative effects on the mineralization ability were less compared with other dental resin monomers including

Bis-GMA. MDPB was found to have superior biocompatibility in terms of function of odontoblastic cells to form hard tissue, and its small negative influences on dentinogenesis were suggested.



The Influence of the Antibacterial Monomer 12-Methacryloyloxydodecylpyridinium Bromide on the Proliferation, Differentiation and Mineralization of Odontoblast-like Cells.

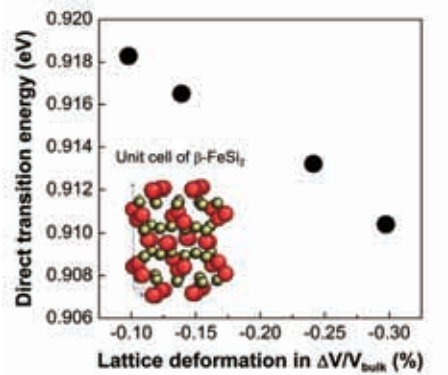
Nishida, M.¹; Imazato, S.¹; Takahashi, Y.¹; Ebisu, S.¹; Ishimoto, T.²; Nakano, T.²;

Yasuda, Y.; Saito, T.

¹(Graduate School of Dentistry)

²(Graduate School of Engineering)

Biomaterials, 31, 1518-1532 (2010)



Iron silicide (β-FeSi₂) is a new semiconductor for silicon-based optoelectronics devices because of their novel optical properties. In this material, it has theoretically been predicted that a strong correlation between band structure and lattice distortion exists, but no researcher has succeeded in the observation. In this paper, we have observed the modification of the direct transition energy by the lattice deformation in the β-FeSi₂ epitaxial films on Si substrates for the first time. The finding opens new area of band-gap engineering of β-FeSi₂ which is necessary for the development of Si-based optoelectronics devices.

Modifications of direct transition energies in β-FeSi₂ epitaxial films grown by molecular beam epitaxy

Noda, K.; Terai, Y.; Hashimoto, S.; Yoneda, K.; Fujiwara, Y.

(Graduate School of Engineering)

Applied Physics Letters, 94, 241907 1-3 (2009)