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Welcome

Encouraged by the success of the 1st and 2nd IEEE International NanoElectronics Conference (INEC) held in Singapore in 2006 and Shanghai in 2008, the 3rd INEC is held in City University of Hong Kong from January 3 to 8, 2010. Extensive research on nanomaterials has unveiled many interesting and promising materials properties for novel applications in electronics, photonics, and biology. In order to benefit mankind for such discoveries, it is necessary to cross the chasm between nanomaterials and nanodevices and their applications. This effort requires a multi-disciplinary approach combining research in materials design, processing, modeling, characterization, and metrology. Commercialization of nanotechnology is also important to fuel future research. The aim of this conference is to identify the paths between fundamental research and potential electronic, photonic, and biological applications. INEC2010 provides a forum for international academics, researchers, practitioners, and students working in the areas of nanofabrication, nanoelectronics, nanophotonics, and nanobiology to discuss new developments, concepts, and practices, and to identify future research needs so that nano-research can be brought closer to its immense potential.

INEC2010 features 4 plenary and 22 invited talks by international scientists in nanofabrication, nanoelectronics, nanophotonics, and nanobiology. A special symposium on nanoscience and nanotechnology in China is held during the conference to foster further scientific exchange between scientists from Greater China and other parts of the world. We are very fortunate to have 16 academicians of the Chinese Academy of Sciences, Chinese Academy of Engineering, and Academia Sinica to give presentations in this special symposium.

INEC2010 is the largest one of this growing event. We are very pleased to have received 911 contributed abstracts including 503 oral and 408 poster presentations from 35 countries and special administrative regions.

Hong Kong being a vibrant and modern city where east and west meet is very exciting. The city offers superb dining and attractions and boasts one of the most impressive skylines in the world. In addition to the technical events, I urge you to experience and enjoy our unique city.

Paul K Chu
General Chair
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Label-free Detection of Glucose based on Quantum Dots
Mei Hu, Haoting Lu, Lihui Yuwen and Lianhui Wang*
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Mesoporous Silica Nanotubes Incorporating with CdS Quantum Dots for Controlled Release of Ibuprofen
Yun-Jie Yang, Xia Tao*, Qian Hou and Jian-Feng Chen
Key Lab for Nanomaterials of the Ministry of Education, Beijing University of Chemical Technology, Bei San Huan Dong Road 15, Beijing 100029, China. *Contacting Author: Xia Tao (phone: +86 10 6445 3680; fax: +86 10 6443 4784; E-mail: taoxia@mail.buct.edu.cn)

Nanowire Field Effect Transistor With its Sub-picomolar Label-free Biosensing Capability Toward a Gene Mutation
Chi-Chang Wu¹, Fu-Hsiang Ko¹*, Ting-Siang Su¹, Bo-Syuan Li¹, and Wen-Fa Wu²
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Preparation and Antibacterial Performance of TiO₂ Nanotube Arrays Loaded with Ag Nanoparticles
Hairong Wang¹, Kaifu Huo ¹²*, and Paul K Chu²
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SnO₂:Zn²⁺ Ultrathin Nanowires with Visible-Light Photocatalytic Activity
Zonglong Zhu, Wei Liu, Zheng Xu
School of Chemistry and Chemical Engineer, Nanjing University, Nanjing, 210093, People’s Republic of China E-mail: zhengxu@nju.edu.cn

Nanophysics Oral Session
Chair: Jun CAI, North China Electric Power University

Prashanthi Kovur, Indian Institute of Technology, Bombay
10:45 Nanopowders of the barium zirconium titanate for applications in electronic devices
Supasarote Muensit⁶* and Nawal Binhayeeniyi
Material Physics Laboratory,Physics Department, Prince of Songkla University, Songkhla, Thailand
Preparation and Antibacterial Performance of TiO\textsubscript{2} Nanotube Arrays Loaded with Ag Nanoparticles

Hairong Wang\textsuperscript{1}, Kaifu Huo \textsuperscript{1,2*}, and Paul K Chu\textsuperscript{2}

\textbf{Abstract} Silver nanoparticle-containing titania nanotube arrays (Ag-TNA) coatings were produced on biomedical Ti implants via simple anodization of Ti in a fluoride-containing solution and photochemical reduction of absorbed AgNO\textsubscript{3}. The structure and composition of the Ag-TNA coatings were characterized and their antibacterial ability and biocompatibility were evaluated in vitro.

\textbf{INTRODUCTION}

Ti and Ti alloys are widely used biomedical implant materials due to superior corrosion resistance, favorable mechanical properties and good biocompatibility \cite{1}. When a Ti implant is introduced into the human body, the surrounding tissue is in direct contact with its surface. It is accepted that the surface topography and chemistry of a Ti biomedical implant are crucial factors affecting protein adsorption, osteoblast proliferation, and differentiation, and finally osseointegration ability. In addition, a nanoscale surface topography has positively influence on the cell response and bone growth around medical implants \cite{2,3}. For this reason, various surface treatments have been developed to form nanoscale surface topography on titanium to improve orthopedic implant integration with surrounding bones. Among these methods, anodization is receiving much attention because it can conveniently create biological nanoscale surfaces that can almost ideally be used as nanoscale spacing models for size-dependent cellular response\cite{4,5}.

In this work, we fabricated silver nanoparticles-containing TiO\textsubscript{2} nanotube array (Ag-TNA) coatings on biomedical Ti implants. The TiO\textsubscript{2} nanotubes provide topographic cues for cell growth simultaneously serving as a reserve for Ag nanoparticles. Ag is an attractive bactericide for its good antibacterial ability with a broad antibacterial spectrum \cite{6,7} and has already been widely used to induce bactericide ability. Such Ag-TNA can release silver for a relatively long time and thus gaining long-lasting antibacterial ability. Hence, it is expected that Ag-TNA coatings can effectively inhibit bacterial adhesion and growth without compromising cell activity while even improving cell growth.

\textbf{EXPERIMENTAL DETAILS AND CURRENT RESULTS}

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The titania nanotubes were fabricated by electrochemical anodization. The Ag nanoparticles were loaded into the tubes via photochemical reduction. In brief, Ti foils (99.7% pure, Aldrich, 10x20x1 mm\textsuperscript{3}) were first polished by SiC sandpapers and then ultrasonically cleaned with acetone, ethanol, and deionized water sequentially. Electrochemical anodization was carried out in a two electrode configuration with a graphite plate cathode and Ti foil anode. After anodization in a glycol solution with 0.5 wt.% NH\textsubscript{4}F for 1 hour at 60 V, the samples were taken out and ultrasonically cleaned, and then annealed in air at 450 °C for 3 h to transform the amorphous TiO\textsubscript{2} nanotubes into anatase structures. The anatase TNA was soaked in 1 M AgNO\textsubscript{3} (>99.8% Purity) for 30 min and then irradiated with ultraviolet light for 30 min using a high pressure Hg lamp. This process was repeated several times to obtain a series of Ag-TNA with different Ag contents.

Fig. 1 A and B are the SEM images of anatase TNA and Ag-TNA, respectively. The diameter and length of the TNA are about 120 nm and 3.5 µm, respectively after loading Ag nanoparticles by photochemical reduction for two runs. The nanotubular structure of the TNA is retained. XPS analysis suggests that the Ag content decreases with depth from 1.9 atom% at the mouth of the nanotube to 0.2 atom% at a depth of 3 µm as shown in Fig. 2. The XPS fine spectra of Ag suggest that Ag exists in the form of Ag\textsubscript{0} (Fig. 3). The TEM images show that the Ag nanoparticles loaded onto the wall of the TNA are about 5-30 nm in size.

The antibacterial ability of the as-prepared Ag-TNA by photochemical reduction for 1, 2, 4 and 6 runs was evaluated using plate counting. Fig. 4 shows the antibacterial effect of the sample immersed in the E. coli bacteria for 1 day, bacteria diluted 10\textsuperscript{5} times, and cultured in flat-panel. Fig. 5 shows the pictures of the samples immersed in E. coli antimicrobial test results after 3 days. These results show that Ag-TNA has good anti-bacterial properties. Ag-TNA coatings have different Ag contents have different lasting anti-bacterial properties. The cell cultures suggest that the low Ag content samples can promote cell adhesion and growth.

In summary, Ag-TNA coatings were fabricated on biomedical Ti implants via simple anodization of Ti in a fluoride-containing glycol solution and subsequent photochemical reduction of absorbed AgNO\textsubscript{3}. Such Ag-TNA coatings have good tissue-integration ability and antibacterial performance.

\textbf{ACKNOWLEDGMENT}
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REFERENCES


