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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 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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18:00 **Toxicity of TiO₂ Nanomaterials Influenced by Dispersion Medium in C. elegans**  
Wenwen Zhang, Liping Tong, Wu Lijun, An Xu*  
Key Laboratory of Ion Beam Bioengineering, Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, Anhui, P.R. China *Contacting author; email: anzu@ipp.ac.cn

18:15 **Synthesis of Hydroxyapatite Film Utilizing Carbon Nanotubes as Template**  
Lifang Niu, Huiyi Kua, and Daniel H. C. Chua*  
Department of Materials Science and Engineering, National University of Singapore, 7 Engineering Drive 1, Singapore 117574 *Contacting author: Daniel H. C. Chua (Phone: 65-65168933, fax: 65-67763604, email: msehcd@nus.edu.sg)

**Nanobiology Poster Session I**

14:00 **Silica Nanoparticles Induce Apoptosis in Human Endothelial Cells via Reactive Oxygen Species**  
Xin Liu, Jiao Sun*  
Shanghai Biomaterials Research & Testing Center / Shanghai Ninth People’s Hospital, Shanghai Jiaotong University School of Medicine, Shanghai, China *Corresponding author: E-mail: jiaosun59@yahoo.com. Address: No.716, Xie-tu Road, Shanghai 200023, P.R. China. Phone: 0086-21-63034903 Fax: 0086-21-63011643

**Synthesis and Cellular Biocompatibility of Two Types of Nanophase Hydroxyapatite with Different Ca/P Molar Ratio**  
Yantao Zhao 1,2, Yumei Zhang 1, Yimin Zhao 1, Shuxun Hou 2, Paul K. Chu 3*  
1 School of Stomatology, Fourth Military Medical University, Xi’an 710032, China 2 Department of Orthopedics, The 304th Clinical Branch of the General Hospital of People's Liberation Army, Beijing, 100037, China. 3 Department of Physics and Materials Science, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong *Contacting Author: Yumei Zhang; Paul K. Chu. (Phone: +86-29-84776090; email: wqtzym@fmmu.edu.cn).

**Synthesis of fluorapatite nanorods enamel prism-like structure in porous alumina template**  
Jie Wei 1,2, Xiaochen Liu 1, Junfeng Jia 2, Yifei Zhang 2, Chengjie Wang 2, Shicheng Wei 1,2, Changsheng Liu 1  
1 Center for Biomedical Materials and Tissue Engineering, Academy for Advanced Interdisciplinary Studies, Peking University, Beijing 100871, P.R.China 2 Key Laboratory for Ultrafine Materials of Ministry of Education, East China University of Science and Technology, Shanghai 200237, P.R.China 3School and Hospital of Stomatology, Peking University, 100081, Beijing

**The effect of nanohydroxyapatite solution on the occluding ability of dentinal tubule**  
Jing Yang 1 Kehua Que 2 Bin Guo*  
1 Tianjin Stomatological Hospital of Nankai University, TianJin city, China 2 State Key Laboratory of Oral Diseases, Sichuan University, China *Contacting Author: Guobin, State Key Laboratory of Oral Diseases, Num 14, Section 3, Road Renminnan, Wuhou district, Chengdu city, Sichuan province, China. Tel:862885503561. Email:denthua@126.com

**A Study on the Preparation and Characterization of Plasmid DNA and Drug-containing Magnetic Nano-liposomes for the Treatment of Tumor**

BP205
Synthesis and Cellular Biocompatibility of Two Types of Nanophase Hydroxyapatite with Different Ca/P Molar Ratio

Yantao Zhao 1,2, Yumei Zhang 1*, Yimin Zhao 1, Shuxun Hou 2, Paul K. Chu 3*

Abstract—The cellular biocompatibility of two types of nanophase hydroxyapatites (HA and CDHA) synthesized by a wet chemical method was assessed using primary cultured osteoblasts. Cytotoxicity of both materials was assessed using primary cultured osteoblasts. The MTT method was used to evaluate the proliferation of osteoblasts on the third day. SEM was used to observe the morphology of the osteoblasts on the third day. Two types of hydroxyapatite showed no cytotoxicity according to the international standard. Higher cell proliferation was observed on the nanophase calcium-deficient apatite (CDHA) than nanophase HA. At the same time, cells spread more actively on the CDHA group. The ALP level of CDHA was also significantly higher on the former. Our results show that on the nanoscale CDHA is more suitable for osteoblasts growth than HA.

I. INTRODUCTION

Hydroxyapatite (HA) which is similar to human bone with regard to chemical composition and has good biocompatibility is one of the most widely used materials in bone repair. Although standard hydroxyapatite has a Ca/P ratio of 1.67, it has been reported that apatite in bone is deficient in calcium with a Ca/P molar ratio below 1.67 and close to 1.5 [1]. Some of the advantages of calcium-deficient apatite [Ca_{10-x}(PO_{4})_{6-x}(HPO_{4})_{x}(OH)_{2-x}, 0 \leq x \leq 1, CDHA] such as composition similar to bone apatite as well as easier decomposition have recently been recognized. With the aid of nanotechnology, nanocrystals can be formed dispersing in the hydroxyapatite matrix and bone-forming cells have been observed to interact favorably with surfaces possessing nanostructured morphology[2]. It is now generally recognized that a nanoscale surface can promote osteoblasts adhesion, proliferation, and function [3]. A systematic investigation on the influence of nano-effect and also the influence of chemical composition in cellular experiments can thus help to optimize the orthopedic materials. In this study, two kinds of nanophase hydroxyapatite were synthesized using a wet chemical method and primary cultured osteoblasts were employed to determine the biocompatibility of the materials.

II. MATERIALS AND METHODS

The hydroxyapatite powders were prepared by an aqueous precipitation method. Calcium nitrate Ca(NO_{3})_{2}·4H_{2}O and diammmonium phosphate (NH_{4})_{2}HPO_{4} were adopted at two different concentrations (1.67/1 and 1.5/1) to obtain nanophase hydroxyapatite with different Ca/P molar ratios. The surface roughness (SR) of the pellets was measured with TR240 SR measuring equipment (ShiDai, China). Field emission scanning electron microscopy (FESEM, JSM-6700F by JEOL, Japan) was used to observe the topography of the samples. Powder X-ray diffraction (XRD) patterns were acquired using the Cu Kα radiation on a θ/2θ diffractometer (Siemens, Model D5000, Germany) after sintering separately at 600ºC for 2 h to determine the component and structure. Cytotoxicity of both materials was investigated with L929 cell line. The MTT method was used to evaluate the proliferation of osteoblasts on the third day. SEM was used to observe the morphology of the osteoblasts on the third day.

III. RESULTS

The X-ray diffraction test showed two kinds of patterns (Fig. 1) produced by two samples after sintering. FESM observation results show the rods like nanoscale morphology of the samples. The HA nanostructures have diameters of 40 to 55 nm and lengths of 79 to 100 nm (Fig. 2). The CDHA nanostructures have diameters of 25 to 40 nm and lengths of 75 to 100 nm (Fig. 3). The Ra value separately is 0.326 ± 0.065 for HA group and 0.340 ± 0.080 for CDHA group (Fig. 4). There was no significantly difference observed between the two groups (P < 0.05). L929 cells have high proliferation rate (RPR) for each group and show an active metabolism activity (Fig. 5). According to international standard ISO 10993-12, the cytotoxicity for HA and CDHA ranked 1 that shows no cytotoxicity for both materials [4].

The cells on both samples exhibit active proliferation. As shown in Fig. 6, the absorbency value of the CDHA group is 1.3 times the value of HA group (P < 0.05). More cells are observed on the CDHA sample by SEM and more active cell morphology is observed on its surface. Osteoblasts react differently to the two kinds of nanophase apatites. Cell growth is better on the nanoscale CDHA surface and the cells show more active morphology (Fig. 7,8). Hence, even though both materials are composed of nanophases, CDHA is suggested to be more suitable for cell growth and tissue engineering scaffolds.

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REFERENCES


Figure 1: XRD patterns: HA and CDHA after sintering at 600°C, 800°C separately.

Figure 2: SEM micrographs for Nanophase HA (100,000X).

Figure 3: SEM micrographs for Nanophase CDHA (100,000X).

Figure 4: Surface roughness for HA and CDHA pellets.

Figure 5: Relative proliferation rate of L929 cells in cytotoxicity test.

Figure 6: Absorbance value of osteoblasts in proliferation test.

Figure 7: Osteoblasts topography revealed by SEM for CDHA (4000 X).

Figure 8: Osteoblasts topography revealed by SEM for HA (4000 X).