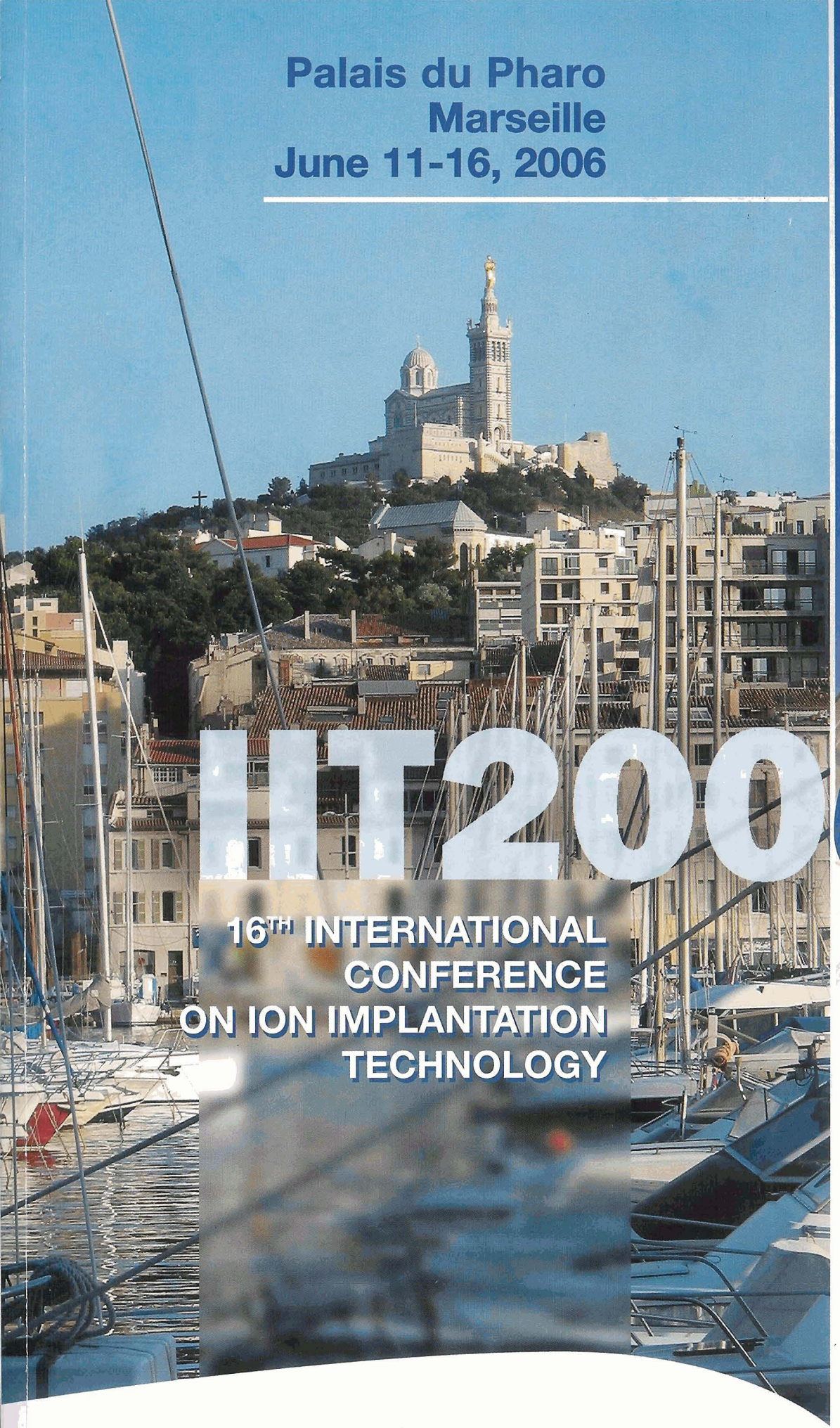
Palais du Pharo
Marseille
June 11-16, 2006



IIT2006

16TH INTERNATIONAL CONFERENCE ON ION IMPLANTATION TECHNOLOGY

Program & Abstracts

Poster Session 2

p238 **Surface Structure and Bioactivity of Porous NiTi Shape Memory Alloys Modified by Plasma Immersion Ion Implantation and Micro-Arc Oxidation**

Mr S L WU, City University of Hong Kong
Department of Physics & Materials Science - Tat Chee Avenue - 00000 Kowloon - Hong Kong

Pr Paul K CHU, City University of Hong Kong
Ms X M LIU, City University of Hong Kong
Dr C Y CHUNG, City University of Hong Kong
Mr F Y JIN, City University of Hong Kong and Southwestern Institute of Physics
Pr C L CHU, City University of Hong Kong and Southeast University
Dr K W K YEUNG, The University of Hong Kong
Dr W W LU, The University of Hong Kong
Dr K M C CHEUNG, The University of Hong Kong

Porous nickel-titanium shape memory alloy is a potential orthopedic material. In addition to its unique shape memory effect and super-elasticity, the porous structure allows bone in-growth which bodes well for tissue recovery. However, the high nickel concentration in the alloy causes health concerns as Ni is known to cause allergic reactions in some patients. In order to mitigate nickel out-diffusion and strengthen the surface properties, plasma immersion ion implantation (PIII) and micro-arc oxidation (MAO) were employed to modify the complex surfaces of porous nickel-titanium (NiTi). Both methods are superior to regular beam-line ion implantation as they can more effectively treat the sidewalls of the pores. The PIII experiments were performed using oxygen plasma. In MAO, the oxidation process took place in an electrolyte solution comprising calcium salt and phosphate. X-ray photoelectron spectroscopy (XPS) and Auger electron spectroscopy (AES) were used to evaluate the surface structures. An oxidized layer containing TiO2, calcium, and phosphate was formed on both the outer and inner walls of the pores after MAO. To investigate nickel out-diffusion, the treated NiTi materials were immersed in simulated body fluid (SBF) at 37oC. The immersion test results indicate that the modified surfaces on both the PIII and MAO samples hinder the out-diffusion of nickel ions effectively. Cells are found to proliferate well on both the PIII and MAO samples. In addition, formation of apatite is observed on the surface of the porous NiTi alloys. There is experimental evidence that the bioactivity of porous NiTi alloys can be improved by MAO.