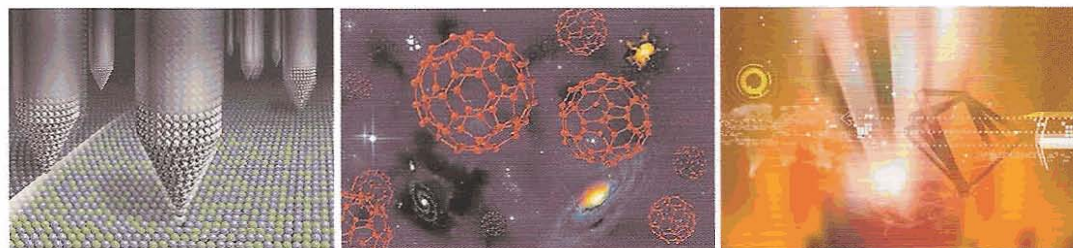


# ABSTRACT BOOK



**IUMRS-ICA-2006**



**September 10-14, 2006 Hotel Shilla, Jeju, Korea**



**Organized by**

Materials Research Society of Korea

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Institute of Information Technology Assessment

Korea Science and Engineering Foundation

Korean Federation of Science and Technology Societies

Jeju Special Self-Governing Province

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Subsequently, downward growing crystals occurred from the hydrate film. In order to examine the influence of nanoparticles quantitatively, the growth rate of downward hydrate crystals were evaluated from the captured video images. The results showed that downward crystals in the presence nanoparticles occurred with greater rate and with finer arm spacing. The detailed characteristics of methane-propane hydrate crystal growth were reported together with the discussion on the influence of nanosized TiO<sub>2</sub>-Ag-SiO<sub>2</sub> particles

13-P-89 Tue. 8:30~12:00 Room : Lotus

#### Synthesis of Nanosized TiO<sub>2</sub>-Ag-SiO<sub>2</sub> Sols by Modified Sol-Gel Method and Their Application for Methane Hydrate Formation

Man Sig Lee<sup>1,2</sup>, Young Seok Kim<sup>1</sup>, Young Myung Hong<sup>1</sup> and Yangdo Kim<sup>2</sup> and Ju Dong Lee<sup>1</sup>

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Nanosized TiO<sub>2</sub>-Ag-SiO<sub>2</sub> sols were prepared with modified sol-gel method using reduction agent. The physical properties of the prepared particles were investigated by TEM, XRD, FT-IR, TGA and DTA. The Titanium tetraisopropoxide (TTIP, 98% Aldrich), tetraethylorthosilicate (TEOS, 98% Aldrich) and silver nitrate were used as precursors of titania, silica and silver, respectively. Sodium citrate tribasic dihydrate (C<sub>6</sub>H<sub>5</sub>Na<sub>3</sub>·2H<sub>2</sub>O, Aldrich) was used as a reduction agent. This paper presents the effect of nanosized TiO<sub>2</sub>-Ag-SiO<sub>2</sub> sols on the formation of methane hydrate in a semi-batch vessel. The micrographs of HR-TEM showed that the TiO<sub>2</sub>-Ag-SiO<sub>2</sub> particles possessed a spherical morphology with a narrow size distribution. The crystallite size of particles decreased with an increasing the SiO<sub>2</sub> content. In addition, the water solution with 1.0 wt% of TiO<sub>2</sub>-Ag-SiO<sub>2</sub> particles acted as promoter for methane hydrate formation. It was also observed that, although the rate of hydrate formation increased, the induction time was not shortened.

## 14. Hardcoatings, Corrosion and Wear

Symposium Chair : Woonsuk Hwang

September 12

Chair : Woonsuk Hwang, Chan-JinPark

14-I-1 Tue. 13:30 Room: Woella

#### Corrosion Resistance of Multi-layered Ti/TiN Coatings on Surgical NiTi alloys in Artificial Saliva

Chenglong Liu<sup>1,2,3</sup>, Paul K. Chu<sup>2</sup>, Dazhi Yang<sup>1</sup>, Guoqiang Li<sup>1</sup>

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It has been shown that orthodontic metal devices made by NiTi alloy may corrode in an acid- and chloride-rich intraoral environment. In the paper, pulsed bias arc ion plating (PBAIP) was conducted on NiTi to produce a multi-layered Ti/TiN coating to enhance the surface anti-corrosion properties. The corrosion behavior was monitored in an artificial saliva solution using electrochemical measurements techniques. The multi-layered Ti/TiN coating was found to improve the

corrosion resistance of NiTi alloy considerably in the test solution, as manifested by the larger free corrosion potential, much lower passive current density, and no breakdown up to 1.5 V. The multi-layered Ti/TiN coating specimens exhibit larger impedance, lower porosity, and an exceedingly low metal ion release rate during 720 h immersion in the test solution. Visual inspection showed significant differences in the corrosion initiation and progress between the treated and untreated specimens after 720 h immersion. Our results reveal that the multi-layered Ti/TiN coating renders the NiTi orthodontic devices more corrosion resistant, as demonstrated by the long-term stability in the simulated intraoral environment.

14-O-1 Tue. 14:00 Room : Woella

#### Effect of delta ferrite on Corrosion Resistance of Type 316L Stainless Steel in Acidic Chloride Solution by Micro-droplet Cell

Sung-Yu Kim<sup>1</sup> and Heesan Kim<sup>1</sup>

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2~4% volume of delta-ferrite( $\delta$ -ferrite) phase is presented in fully austenitic stainless steels such as type 316L because of improving hot workability. More than 4% volume of  $\delta$ -ferrite phase is known to be formed during non-equilibrium solidification such as welding. However, the effects of  $\delta$ -ferrite on the corrosion resistance of austenitic stainless steels were reported by some researchers only and the reason was not clearly understood yet. In order to get the better understanding of the mechanism on how the  $\delta$ -ferrite affects the corrosion resistance, electrochemical tests in a micro-droplet cell were conducted and microstructures were analyzed by TEM-EDS, SEM-EDS, and image analyzer. Especially, the micro-droplet cell was modified in this study and employed to observe the polarization behavior of  $\delta$ -ferrite phase in an acidic chloride solution. The pitting corrosion was not observed around/on  $\delta$ -ferrite but around inclusion indicating that the pitting corrosion resistance is independent of the presence of pitting corrosion resistance. The anodic polarization behavior in the active region and the active-passive transition region was affected by  $\delta$ -ferrite. The degradation of corrosion resistance in the low potential regions by  $\delta$ -ferrite is due to the preferential dissolution of a matrix( $\gamma$  phase), which is explained with the fact that the formation of  $\delta$ -ferrite lower the concentrations of chromium and molybdenum in the matrix. It is confirmed by EDS analysis, phase-equilibrium prediction and potentiostatic test.

14-O-2 Tue. 14:15 Room : Woella

#### Plasma-Chemical Deposition of Diamond-Like Films Using a Novel DC Arc Plasmatron

Ji Hoon Kim<sup>1</sup>, V.Yu. Plaksin<sup>1</sup>, V.A.Riaby<sup>1</sup>, Chi Kyu Choi<sup>2</sup> and Heon-Ju Lee<sup>1</sup>

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Plasma-chemical process of diamond-like film deposition was tested at the atmospheric and lowered pressures (P=1 & 10<sup>-3</sup> atm) using recently developed high durability plasmatron. Working gases were H<sub>2</sub> and CH<sub>4</sub>. A stainless steel or silicon sample was fixed on a grounded metal holder at the distance of 15-20 mm from the nozzle. Preparation stage included the sample heating up to 1000°C and the oxygen processing with ion bombardment of a sample at the bias of -100...-200 V. At P=1 atm, the nozzle of plasmatron was surrounded with a argon