

Mid-Term Report

Date : 24/05/2010

Name :	Akiko Obata
Status :	Assistant Professor, Graduate School of Engineering, Nagoya Institute of Technology
Name of Exchange University :	Imperial College London (UK)
Research Theme :	Development of novel polymer and ceramics hybrid biomaterials
Duration :	Oct. 2009 ~ Sep. 2010
NITECH Faculty Advisor :	
Exchange University Faculty Advisor :	Dr. Julian R Jones
Research Theme in detail :	
< Goal >	
<p>Aim of this work is to develop hybrid biomaterials enhancing bone formation using poly(glutamic acid) (PGA) and siloxane-doped vaterite (CaCO_3). PGA is one of the biodegradable polymers. The siloxane-doped vaterite, which has been developed by our research group, releases soluble silica and calcium ions. These ions have been reported to enhance bone formation. I tried to prepare the hybrid materials without organic solvent and then control the degradation speed of PGA in the materials.</p>	
< Report on the Progress of Your Research >	
<p>PGA aqueous solution was prepared by mixing $\text{Ca}(\text{OH})_2$, PGA and water. Vaterite powders were mixed in the solution and then dried, resulting in the formation of PGA and vaterite composites. The vaterite phase did not change to calcite, which is the most stable phase in the polymorphs of calcium carbonate, in the solution containing an adequate amount of PGA. The degradation speed of PGA in the composites was controlled by adding a silane coupling in the PGA aqueous solution before mixing vaterite powders. The coupling might make hybrid and cross-linking in the PGA matrix structure in the composites.</p>	
< Your future research plans >	
<p>Chemical structure of the prepared composites will be analyzed by FTIR and NMR. Soluble silica and calcium ions-releasing ability of the composites will be examined.</p>	

About the laboratory you have been sent to (Number of faculty and students, methods used in research activity) :

Dr. Jones, 1 PhD researcher, and 10 PhD course students.

Doing their work in collaboration with other research groups in ICL, other Universities, and some companies. It's pretty aggressive.

Comments about the workshops and seminars you have attended:

I attended at one international conference, "22th Inter. Symp. Ceramics in Medicine" held in Korea. This conference is one of the most famous one in the bioceramics research field. I was able to get a lot of the latest information of the research field and discuss our research with researchers from various backgrounds.

List the seminars and workshops you will be attending:

1. Electrospun Fibrous Membranes Based on Poly(lactic acid) for Guided Bone Regeneration. Akiko Obata, Takashi Wakita, Yoshio Ota and Toshihiro Kasuga. 22th Inter. Symp. Ceramics in Medicine, Daegu, Korea, Oct 26-29, 2009.
2. Ion Releasing Abilities of Phosphate Invert Glasses Containing MgO, CaO or SrO in Tris Buffer Solution. Sungho Lee, Akiko Obata and Toshihior Kasuga. 22th Inter. Symp. Ceramics in Medicine, Daegu, Korea, Oct 26-29, 2009.
3. Cell-Intercepting Ability of Electrospun Poly(lactic-acid)-based Fibermats. Kie Fujikura, Akiko Obata and Toshihiro Kasuga. 22th Inter. Symp. Ceramics in Medicine, Daegu, Korea, Oct 26-29, 2009.
4. Preparation of Poly(lactic acid)/Si-doped Vaterite Hybrid Microbeads. Jin Nakamura, Akiko Obata and Toshihiro Kasuga. 22th Inter. Symp. Ceramics in Medicine, Daegu, Korea, Oct 26-29, 2009.
5. Polymer-based Composite Coating on Zirconia Ceramics. Yuta Kogo, Akiko Obata and Toshihiro Kasuga. 22th Inter. Symp. Ceramics in Medicine, Daegu, Korea, Oct 26-29, 2009.
6. Poly(lactic acid)-based Fibrous Membranes Releasing Silicon Species. Akiko Obata, Toshihiro Kasuga, Julian R Jones. TERMIS-EU 2010, Galway, Ireland, Jun 13-17, 2010. (accepted).

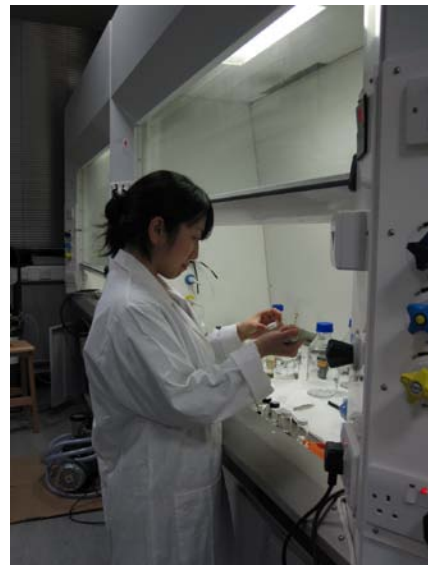
7. Preparation of Poly(lactic acid)-based Fibrous Membranes Releasing Silicon Species by Electrospinning. . Akiko Obata, Toshihiro Kasuga, Julian R Jones. 23rd European Conference on Biomaterials, Tampere, Finland, Sep 11-15, 2010. (accepted).
8. Optimization of Fiber Diameter in Electrospun Fibermat for Three Dimensional Tissue Engineering Scaffold, Kie Fujikura, Akiko Obata, Toshihiro Kasuga, The 23rd European Conference on Biomaterials, Tampere, Finland, Sep 11-15, 2010. (accepted)
9. Preparation of Scaffold Materials Releasing Silicon and Calcium Ions for Bone Reconstruction. Akiko Obata, Shinya Yamada, Toshihiro Kasuga, Julian R Jones. The 3rd International Congress on Ceramics (ICC3) (submitted).

Your research plans for the remainder of this term :

I am thinking of doing mainly characterization of my samples developed so far and extending my knowledge through the characterization.



↑ BBQ with my laboratory group member



↑ Laboratory work.