23rd. European Conference on Biomaterials

Tampere, Finland

11 - 15 September 2010

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Pusat Pengajian Sains Pergigian

TAMPERE UNIVERSITY OF TECHNOLOGY

23RD EUROPEAN CONFERENCE ON BIOMATERIALS
ESB2010 September 11-15, 2010, Tampere

2010

TAMPERE
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Poster Session 2, Tuesday September 14th, 2010 at 15.00–16.00

No. ID **Absorbable Biomaterials**

2. 3274 Homogenous Morphology Control of Carbonate-Substituted Hydroxyapatite Block Prepared by Double-Step Hydrothermal Method
S. Prakash Parthiban *and C. Ohtsuki*

4. 3542 Evaluation of Calcium Phosphate and Calcium Sulfate and Bioglass as Carriers for Protein Extract in Bone Substitutes
H Tölli*, K Sandström, P Jalovaara, T Jämsä*

6. 3438 Precipitation of Calcium Phosphates in the Presence of Ionic Surfactants
B. González*, A. J. Salinas, O. Mersinlioglu, M. Vallet-Regí*

8. 3702 Homogeneity of nanohydroxyapatite - poly(lactide-co-glycolide) composite biomaterials
J. Chłopek*, A. Morawska-Chochol, E. Menaszek, K. Gryn*

10. 3508 A novel Calcium Phosphate-Calcium Silicate Composite
M. Alkhraisat*, J.L Aparicio, A. Ewald, C. Rueda, L. J. Blanco, Gbureck U, E. L. Cabarcos*

12. 3788 Comparison of Additives to Modify Setting Time of Tricalcium Phosphate Cements
Z.Irbe*, L.Vecbiskena, N.Borodajenko, L.Berzina-Cimdina*

14. 3510 A Potential Switch to Modulate Drug Release from Cement Systems: the Case of Vancomycin
J.L Aparicio, M. Alkhraisat, C. Rueda, L. J. Blanco, Gbureck U, ***E. L. Cabarcos***

16. 3656 Photocrosslinked poly(ester anhydride) for controlled delivery of peptide YY3-36
J. Mönkäre*, R.A. Hakala, M. Kilpeläinen, K.H. Herzig, H. Korhonen, J.V. Seppälä, K. Järvinen*

18. 3882 Acrylic ion exchange resin/polysaccharide microparticles as drug carriers
S. Vasiliu, S. Racovita , I. Bunia, ***M. Popa****, M. Mandru*

20. 3906 Release of Rifampicin from Composites of Lactide Based Copolymers and TCP
Niina Ahola*, Minna Veiranto, Minna Kellomäki*

22. 3436 Improved in vitro Testing of Degradable Magnesium
J. Fischer*, D. Proefrock, N. Hort, R. Willumeit, K.U. Kainer, A. Schreyer, F. Feyerabend*

24. 3644 Repair of a pigeon long bone cortical defect filled with collagen and autograft bone
N. Miño-Fariña*, F. Muñoz-Guzón, M. López Peña, A. González-Cantalapiedra, F. San Román-Ascaso, J. Rodriguez-Quiros*

26. 3694 Antimicrobial activity of silver doped brushite cement
A. Ewald*, D. Hösl, S. Patel, L.M. Grover, J.E. Barralet, U. Gbureck*

28. 3940 Mechanical Testing of Olecranon Fracture Fixation Model with Metallic or Bioabsorbable Fixation Methods
J. Mikkonen*, T. Brinck, K. Paakinaho, H. Heino, I. Sinisaari*

30. 3810 Cathodic Electrospinning of Chitosan
D. Terada*, C. Yoshikawa, K. Zhang, A. Tiwari, S. Hattori, T. Honda, T. Ikoma, and H. Kobayashi*

32. 3892 Preparation, characterization and hydrolytic degradation studies of organoclay/Poly(lactic acid) nanocomposites for biomedical applications
Petroula Tarantili*, Christina Stathokostopoulou*

34. 3782 Processing Effects on Mechanical Properties of a Novel Resorbable Biomaterial
A. Elleray, ***J. Wilson****, G.R. Webster, D. Langton, L. Mulvaney-Johnson, A. Kelly, D. Farrar, B. Wilson, M. Jarman-Smith*

36. 3890 Surface Property of Temperature-Responsive Polymeric Thin Surface Observed by Atomic Force Microscopy
Y. Kumashiro*, K. Fukumori, H. Takahashi, M. Nakayama, Y. Akiyama, K. Sakai, M.Yamato, and T. Okano*

38. 3894 Characterization of PEG-like films obtained in plasma condition
G. B. Rusu, D. Spridon. ***I. Topala****, N. Dumitrascu*

40. 3456 Study of the Osteogenic Differentiation Potential of Bone Marrow Stromal Cells
S. Van Vlierberghe*, L. Fassina, E. Saino, L. Visai, E. Schacht and P. Dubruel*

42. 3468 Thermoreversible Injectable Hydrogels from Multifunctional Bioactive Elastin-like Recombinamers
L. Martín*, A. Girotti, M. Alonso, I. M. López, J.C. Rodríguez-Cabello*

44. 3494 Silica-collagen-calcium phosphate composite materials for bone replacement. In vitro-manipulation of the ratio of bone forming to bone resorbing cells in a co-culture
Sascha Heinemann, Christiane Heinemann, Hartmut Worch, ***Thomas Hanke***

180. 3402 Enhancement of Calcium Nodule Production in Osteoblast Cultures
Halil Murat Aydin, *Bin Hu, Alicia El Haj, Ying Yang*

182. 3806 Molecularly Imprinted Scaffolds For Tissue Growth Technology
Niccoletta Barbani, *Elisabetta Rosellini, Caterina Cristallini, Gianluca Ciardelli, Mariacristina Gagliardi and Paolo Giusti*

184. 3846 Testing of Collagen-Mimetic Dried Hydrogels with Different Gelators for Culturing of Human Embryonic Stem Cell Derived Cardiomyocytes
Liisa M. Ikonen, *Gerald Metselaar, Menno de Jong, Katriina Aalto-Setälä, and Erja Kerkelä*

186. 3902 Alginate-Scaffolds for Cochlear Implant Optimisation
V. Scheper, *F. Ehrhart, H. Zimmermann, T. Lenarz*

188. 3850 Crosstalk between endothelial cells and fibroblasts in modulating the healing response
S Guerreiro, *RE Unger, A Sartoris, MJ Oliveira, MA Barbosa, R Soares, PL Granja, CJ Kirkpatrick*

No. ID Clinical Tests/Studies

190. 3744 Manual Segmentation of Lymphoma for MRI Texture Analysis
Lara C.V.Harrison, Kirsi K. Holli, ***Sami Savio***, *Minna Lahtinen, Seppo Soimakallio, Prasun Dastidar, Hannu J. Eskola*

192. 3764 Prosthetic Wear Measurement of Total Knee Arthroplasty using Phase Shifting Profilometry
Michal Pochmon, *Tomas Rössler, Jiri Gallo, Miroslav Hrabovsky*

194. 3896 Comparison of the Mechanical Characteristics of Different Plates and Screws after Sagittal Split Osteotomy by using Finite Element Method
Toshiro Matsumoto, *Tomokazu Motohashi, Masahiro Nakajima, Kenji Kakudo*

196. 3268 Porous PMMA loaded with Calcium phosphates
M.A. Lopez-Heredia, *J.G. Wolke, J.R. de Wijn and J.A. Jansen*

No. ID Dental

198. 3374 Chlorhexidine release promotion from dental composites via reactive calcium phosphate addition
I. Mehdawi, ***A. Young***

200. 3818 New sol-gel coatings for dental applications
L. Buruaga, *G. Goikoetxeaundia, M.J. Juan, M. Hernández, M. Gurruchaga, I. Goñi, J. Suay*

202. 3678 FEM experimental study on dental resins for complete dentures
Cristina Maria Bortun, Anghel Cernescu, Brandusa Ghiban, Nicolae Faur, Nicolae Ghiban

204. 3918 Structural Investigation of Dental Stainless Steels Alloys after Laser Optimization
A. Ghiban, C.M. Bortun, P. Moldovan, ***B. Ghiban***, *N. Ghiban, A.M. Magheru*

206. 3342 Effects of Phase Constitution of Zr-based Alloys on Their Magnetic Susceptibility to Prevent Artifacts in MRI
N. Nomura, *Suyalatu, R. Kondo, K. Oya, Y. Tsutsumi, H. Doi, T. Hanawa*

208. 3746 Characterization of Biphasic Calcium Phosphate doped with Zirconia
S.M. Masudi, *M.S.M. Yussoff, Z.A. Rajion, A.Hussein, D. Mohamad*

210. 3780 Fabrication of the new zirconia block and evaluation of the fit of porcelain veneered crown
Y. Seo, G.Oh, K. Lee, K. Lee, H. Kim, H. Yang, J. Koh, H. Lim, ***S. Park***

212. 3856 Characterisation of Zirconia Bars and Implications for Improved Mechanical Resistance in Dental Applications
T. Traykova, *C. Mochales, A. Maerten, P. Zaslansky, C. Fleck, W-D. Mueller*

214. 3840 Osteogenic differentiation of mesenchymal stem cells upon bioactive ceramic engineered granules
K. S. Lee, J. E. Won, J. J. Kim, S. H. Bang, J. S. Park, U. S. Shin, ***H. W. Kim***

216. 3880 Characterization of Isolated Populations of Human Dental Pulp Cells
Obi Egbuniwe, *Lucy Di Silvio, Andy Grant, Tara Renton*

No. ID Drug Release Technologies

218. 3664 Modelling Drug Delivery from Stents through a Finite Element Analysis
Mariacristina Gagliardi, *Davide Silvestri, Caterina Cristallini*

220. 3730 Surface Modification to Optimize Nanogel-based Antigen Delivery
Catherine A. Schütz, *Lisa J. Harwood, Peter Käuper, Kenneth C. McCullough, Christine Wandrey*

222. 3772 Synthesis and Characterization of a Novel pH-sensitive Nanocarrier for Targeted Drug Delivery
Mariacristina Gagliardi, *Davide Silvestri, Caterina Cristallini and Niccoletta Barbani*

224. 3774 Antimicrobial activity of different silver-containing materials
P. Lalueza, *M. Monzón, M. Arruebo, J. Santamaría*

ESB2010 September 11-15, 2010, Tampere Hall

	Saturday Sept. 11	Sunday Sept. 12	Monday Sept. 13	Tuesday Sept. 14	Wednesday Sept. 15
8:00					
8:30					
9:00			Plenary lectures	Plenary lectures	Plenary lectures
9:30					
10:00			Sessions	Sessions	Sessions
		Coffee	Coffee & Posters	Coffee & Posters	Coffee
11:30					
12:00				Jean Leray 2010	Closing ceremony
12:30		Lunch	Lunch	Lunch	
14:00					
14:30					
15:00		Coffee & Poster Session 1	Coffee & Exhibition	Coffee & Poster Session 2	
16:30	Registration Desk at Tampere Hall at 15.00-19.00				
17:00					
17:30					
18:00					
18:30					
19:00	Get Together at Tampere Hall				
19:30		Informal evening gathering at Plevna Brewery Pub	Chairman's Dinner / Students' Networking		
20:00					
20:30					
21:00				Gala Dinner	
21:30					
22:00					

Changes are possible.

Characterization of Biphasic Calcium Phosphate doped with Zirconia

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Introduction: Calcium phosphate ceramics have gained wide-spread attention due to their compositional and structural similarity to the mineralized constituent in hard tissues. Hydroxyapatite is the main mineral constituent of natural bone, and thus synthetic calcium phosphate ceramics may create an excellent bond with natural tissue and can even stimulate new bone growth. Biphasic Calcium Phosphate (BCP) is a mixture of HA and β-TCP that has been used extensively for dental applications and bone grafts. BCP is bioactive and bioresorbable materials that can be controlled by manipulating the HA to β-TCP ratio. Another advantage of BCP is the strong direct bonding with host bone. However, due to their relatively low strength and toughness, susceptibility to physiological attack and poor fatigue properties, the biomedical uses of BCP are limited to non-load bearing applications. One of the most promising approaches to increase the strength in ceramics is through transformation toughening based on the tetragonal-monoclinic transformation of Zirconia (Zr). A ceramic with dispersed tetragonal Zr in the form of ZrO_2 can be used to produce a biocomposite Zr and calcium phosphate biomaterial for better strength, x-ray contrast and opaqueness. To this aims, we carried out a chemical and structural analysis of Zr-doped BCP.

Objectives: To determine the characterization of BCP-Zr material by using Scanning Electron Microscopy (SEM) and X-ray Diffraction (XRD) techniques.

Material and Methods: The method used for the synthesis of Zr-doped $Ca(PO_4)$ involved a solid state reaction method and blending of ZrO_2 with a $Ca(PO_4)$ compound. Synthesized Zr-doped $Ca(PO_4)$ that results from this method has several advantages, i.e. a strong bond between Zr and the $Ca(PO_4)$ without loss of Zr as well as a more homogenous Zr distribution. BCP with Zirconia was prepared using organic diethyl hexyl phosphoric acid (DEHPA) as the source for phosphate.

An amount of 60 g calcium hydroxide [$Ca(OH)_2$] was diluted in 300ml distilled water and activated using a magnetic stirrer at 70°C for 2 hours after which it was allowed to cool to room temperature. An amount of 5g of zirconyl chloride octahydrate was diluted in 150ml 4M HCl, stirred and heated to 70°C until zirconyl chloride octahydrate was fully dissolved. The solution was then mixed with 300ml di-(2-ethyl-hexyl)-phosphate (DEHPA), stirred for 20 minutes and separated by using a separating funnel glassware. Two layers were formed; the bottom layer (supernatant) was discarded while the upper layer, the organophosphate solution, was used for the next step. The solution of organophosphate was added slowly (drop by drop) using a separating funnel to the $Ca(OH)_2$ solution, while stirred continuously for 2 hours (until organophosphate solution was finished). The mixed solution was left overnight, thus allowing the formation of a BCP-Zr precipitate. The preparation of BCP-Zr was continued with filtering using funnel and filter paper on rubber stopper vacuum glass that connected with vacuum machine. The BCP-Zr precipitate was collected from filter paper in the funnel and stored in the beaker glass covered with aluminum foil for drying process. Drying process was performed in an oven universal at 72°C for 24 hours. The BCP-Zr precipitate was then placed in the clay crucible for calcinations process. Calcinations were performed in a furnace at 1000°C for 3 hours resulting in BCP doped Zirconia powder.

Scanning Electron Microscopy analysis has been performed on a CaPZr to characterize the elemental distribution near the interface. SEM-EDX analysis was performed in a Leo Supra 50 VP Field Emission SEM equipped with Oxford INCA 400 energy dispersive X-ray microanalysis system (Leo Supra 50VP, Zeiss, Oberkochen, Germany). A powder X-ray diffraction (XRD) technique was used to characterize the crystallinity and crystallographic phase structure of the BCP products.

Results and Discussion: Figure 1 shows SEM image indicates the phases present in initial calcium phosphate sample are β-TCP and β-$Ca_2P_2O_7$. Upon addition of Zr, the major phases are HA and β-TCP (BCP). This shows that some crystal structure changes occurred with the addition of Zr that resulted in formation of BCP (Figure 2). Zirconia shows to be exists in monoclinic, tetragonal and cubic polymorphs. At room temperature only single phase monoclinic is known to be stable but there are reports stating the existence of metastable single phase tetragonal zirconia.