

This article was downloaded by:

On: 28 January 2011

Access details: *Access Details: Free Access*

Publisher *Taylor & Francis*

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Phosphorus, Sulfur, and Silicon and the Related Elements

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713618290>

Direct Observation of Apatite Formation on Bioglass in Simulated Body Fluid by Atomic Force Microscopy

Jun-Ichi Hamagami^a; Gou Yamaguchi^a; Kiyoshi Kanamura^a; Takao Umegaki^a

^a Tokyo Metropolitan University, Japan

Online publication date: 27 October 2010

To cite this Article Hamagami, Jun-Ichi , Yamaguchi, Gou , Kanamura, Kiyoshi and Umegaki, Takao(2002) 'Direct Observation of Apatite Formation on Bioglass in Simulated Body Fluid by Atomic Force Microscopy', *Phosphorus, Sulfur, and Silicon and the Related Elements*, 177: 8, 1921 — 1922

To link to this Article: DOI: 10.1080/10426500213440

URL: <http://dx.doi.org/10.1080/10426500213440>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.



DIRECT OBSERVATION OF APATITE FORMATION ON BIOGLASS IN SIMULATED BODY FLUID BY ATOMIC FORCE MICROSCOPY

*Jun-Ichi Hamagami, Gou Yamaguchi, Kiyoshi Kanamura,
and Takao Umegaki*
Tokyo Metropolitan University, Japan

(Received July 29, 2001; accepted December 25, 2001)

An in situ atomic force microscope (AFM) combined with surface potential measurement was used to observe the apatite formation on the 45S5 Bioglass-type glass in simulated body fluid (SBF). From the observation, it can be seen that small islands with 5–10 nm size are formed on the glass surface in the initial soaking period within 1 h.

Keywords: Apatite growth process; atomic force microscopy; bioglass; in situ observation; simulated body fluid

Artificial hydroxyapatite and Bioglass, which contain phosphorous element, are well known as bioactive materials in a medical field. During an implantation of these materials in a human body, the materials are gradually bonded to a natural bone through a bonelike calcium phosphate apatite layer formed by chemical reactions of the bioactive materials in human body fluid around 37°C. However, the chemical reactions occurring on the material surfaces have not been well understood. In order to obtain some new information on this problem, a direct observation technique has been used. In this study, an in situ AFM combined with surface potential measurement was used to observe the apatite formation on the Bioglass in SBF with ion concentrations which nearly equaled to those of human blood plasma. From AFM observation, it can be seen that small islands with

This present work was partially supported by Grant-in-Aid for Scientific Research (B) No. 12450271 from JSPS.

Address correspondence to Jun-ichi Hamagami, Department of Applied Chemistry, Graduate School of Engineering, Tokyo Metropolitan University, 1-1 Minami Osawa, Hachioji, Tokyo, 192-0397, Japan. E-mail: hamagami-junichi@c.metro-u.ac.jp

5–10 nm size are formed on the glass surface in the initial period. These islands correspond to nuclei of apatite. These nuclei grew very slowly in SBF solution. This means that the growth of nuclei is a limiting process for the formation of the calcium phosphate apatite layer.