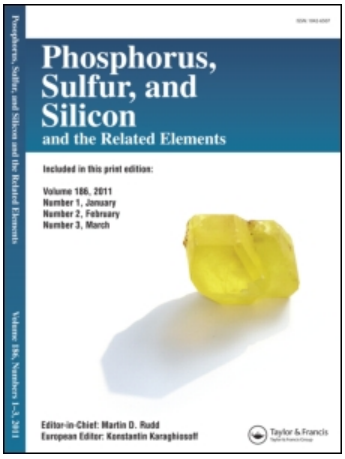

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Direct Observation of Apatite Formation on Bioglass in Simulated Body Fluid by Atomic Force Microscopy

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

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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

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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.