

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>

Microstructural Changes of Stainless Steel Surface by Hydroxyapatite and Metal Alternate Electrochemical Plating

Mikako Nakashima^a; Hiroko Shimizu^a; Hideki Monma^a; Satoshi Takahashi^a; Toshinori Okura^a; Masao Kosaka^a

^a Kogakuin University, Japan

Online publication date: 27 October 2010

To cite this Article Nakashima, Mikako , Shimizu, Hiroko , Monma, Hideki , Takahashi, Satoshi , Okura, Toshinori and Kosaka, Masao(2002) 'Microstructural Changes of Stainless Steel Surface by Hydroxyapatite and Metal Alternate Electrochemical Plating', *Phosphorus, Sulfur, and Silicon and the Related Elements*, 177: 8, 1923 – 1924

To link to this Article: DOI: 10.1080/10426500213383

URL: <http://dx.doi.org/10.1080/10426500213383>

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.

MICROSTRUCTURAL CHANGES OF STAINLESS STEEL SURFACE BY HYDROXYAPATITE AND METAL ALTERNATE ELECTROCHEMICAL PLATING

Mikako Nakashima, Hiroko Shimizu, Hideki Monma, Satoshi Takahashi, Toshinori Okura, and Masao Kosaka
Kogakuin University, Japan

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

Calcium hydroxyapatite [$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$; HAp] coatings have been studied for a bioactive modification of stainless steel surface. HAp coatings are easily made on metallic substrates by electrolysis, however the coating layers become inevitably porous due to the generation of H_2 gas. In this study, we report that the pores were filled with metals by the additional electroplating of the metals.

An electrolyte named E_A for HAp coating was prepared by dissolving $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$, NaNO_3 , NaF , and nitric acid, and maintained at 80°C . The working electrodes were two platinum sheets, and plating electrode was stainless steel. First, a constant direct current at $10\text{mA}/\text{cm}^2$ was passed for 5 min through the E_A for the deposition of

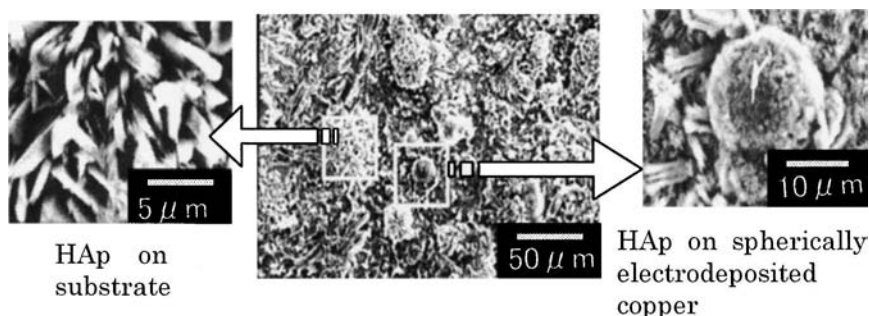


FIGURE 1 SEM micrographs of electrodeposited HAp-copper-HAp multilayered coating. (pH of $E_A = 3.0$).

Address correspondence to Mikako Nakashima, Department of Industrial Chemistry, Graduate School of Engineering, Kogakuin University, 2665-1 Nakano-cho, Hachioji, Tokyo 192-0015, Japan.

HAp on the cathode substrate. Thus obtained HAp-coated substrates were treated as the cathode by electrolyzing solutions containing metal ($M = \text{Zn, Cu, or Fe}$) ions at 25°C under similar electrolysis conditions. Next, thus obtained cathode substrates were treated as the cathode by electrolyzing E_A again under the same conditions (Figure 1). The resulting HAp-metal-HAp multilayered coatings were characterized by SEM, XRD peak-separation analysis, and TF-XRD.