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Effect of Fluoride Concentration and pH on Corrosion Behavior of Titanium for Dental Use

M. Nakagawa

Department of Dental Materials Engineering, Faculty of Dentistry, Kyushu University, Higashi-ku, Fukuoka 812-8582, Japan

S. Matsuya

Department of Dental Materials Engineering, Faculty of Dentistry, Kyushu University, Higashi-ku, Fukuoka 812-8582, Japan

T. Shiraishi

Department of Dental Materials Engineering, Faculty of Dentistry, Kyushu University, Higashi-ku, Fukuoka 812-8582, Japan

M. Ohta

Department of Dental Materials Engineering, Faculty of Dentistry, Kyushu University, Higashi-ku, Fukuoka 812-8582, Japan

Abstract

Titanium is used as a metal for biocompatible materials such as dental implants or restorations because of its excellent chemical stability. However, the corrosion of Ti in the prophylactic fluoride-containing environment can become problematic. To clarify the effects of fluoride concentration and pH on the corrosion behavior of Ti, we conducted anodic polarization and immersion tests in NaF solution of various concentrations and pH values. The concentrations of dissolved Ti in the test solutions were analyzed by inductively coupled plasma mass spectroscopy. There were obvious limits of fluoride concentration and the pH value at which the corrosion behavior of Ti changed. The corrosion of Ti in the solution containing fluoride depended on the concentration of hydrofluoric acid (HF). When the HF concentration in the solution was higher than about 30 ppm, the passivation film of the Ti was destroyed. The results of this study revealed a relation between the fluoride concentrations and pH values at which Ti corrosion occurred and provided data on such corrosion in environments where the fluoride concentration and pH value are known.

[titanium](#) [corrosion](#) [fluoride](#)

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