

Short Communication

Corrosion Resistance of Passive Films on Orthodontic Bands in Fluoride-Containing Artificial Saliva

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doi: 10.20964/2017.01.45

Received: 7 October 2016 / Accepted: 18 November 2016 / Published: 12 December 2016

The purpose of this study was to evaluate the influence of fluoride ions on the corrosion behavior of orthodontic bands in artificial saliva. Thirty as-received orthodontic bands were divided into five groups randomly, and then immersed in fluoride-containing artificial saliva with different NaF concentrations (0wt.%, 0.1wt.%, 0.3wt.%, 0.5wt.% and 1wt.%) separately at 37°C for 30 days. Potentiodynamic polarization, electrochemical impedance spectroscopy(EIS) and Mott-Schottky measurements were used to study the corrosion behaviour of orthodontic bands. Surface characterization was observed with scanning electron microscope (SEM) and energy dispersive X-ray spectrum (EDS). Statistical analysis was carried out using 1-way analysis of variance (ANOVA). The pitting corrosion could be observed on the orthodontic bands in fluoride-containing artificial saliva. With the increase of concentration of fluoride, corrosion current density increased, corrosion potential, pitting potential and the impedance of passive film decreased. Passive films of the bands formed at high concentrations of NaF had more disordered structures and higher defect densities. There were significant differences for pitting potential, corrosion current density, polarization resistance and carrier density of the experimental groups compared with control group ($P < 0.05$). Fluorine ion participated in the development of pitting corrosion of orthodontic bands in artificial saliva. Severe corrosion occurred with the increase of concentration of fluoride. For more efficient treatment, the amount and the frequency of using fluorine-containing products should be considered in clinic.

Keywords: Orthodontic band; Fluoride; Potentiodynamic polarization; EIS; Passive film

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