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SURFACE CHANGES (SCANNING ELECTRON MICROSCOPE) INDUCED BY ARTIFICIAL SALIVA IN TITANIUM-MOLYBDENUM ORTHODONTIC LOOPS

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ABSTRACT

This work, intended to assess the effect of saliva pH (4 and 6,75) at different times (3 and 5 months) using a descriptive analysis of the microtopography (scanning electron microscope, (SEM)) of a commercial titanium-molybdenum alloy (TMA,Ormco Corp, Glendora, Calif) with a 0,017” x 0,025” section. SEM analysis was carried out at Materials Centre of the University of Porto (CEMUP) and micrographs with x2000 and x5000 magnification were obtained using a JEOL JSM 6301F high resolution.

Keywords: orthodontics, corrosion, saliva, TMA.

INTRODUCTION

Orthodontic wires are shaped into various configurations to apply forces to teeth. Various types of orthodontic wires are used based on their properties (Maijer, 1986). The evolution, process, through laboratory and clinical research, has been conducted to promote suitable material properties against factors that daily decrease the survival rate, but the perfect material has not yet been achieved (Souza, 2008). The composition of saliva and its properties can be affected by many variables such as physiological nutritional factors, diet and salivary flow. The oral cavity with changes and individualities of pH, can help trigger undesirable reactions produced by the response of this environment, such as the acceleration of corrosion process.(Kao, 2010). In order to withstand corrosion, beta-titanium alloys depend on the formation of a passive film at its surface. Nevertheless even with this protective layer, some ions can still be released. The acidic conditions of the oral environment can contribute to this process (Kuhta, 2009).

In this work, we intended to assess the effect of saliva pH (4 and 6,75) at different times (3 and 5 months) using a descriptive analysis of the microtopography of a commercial titanium-molybdenum alloy (TMA,Ormco Corp, Glendora, Calif) with a 0,017” x 0,025” section. SEM analysis was carried out at Materials Centre of the University of Porto and micrographs with x2000 and x5000 magnification were obtained using a JEOL JSM 6301F high resolution.

RESULTS AND CONCLUSIONS

The x2000 and x5000 magnification selection is in accordance with Juvvadi *et al.* for the observation of orthodontic wires by SEM (Juvvadi, 2010). Comparing images for each magnification it is possible to see that the wire surfaces before immersion in saliva (Figures 1

and 2) show the highest irregularities one presenting higher irregularities. Regarding the immersion time, differences between samples after the period of 3 or 5 months are not clearly seen.

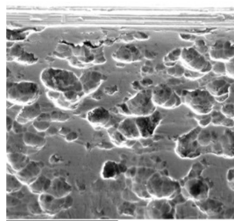


Fig. 1 - SEM (x2000) before immersion in saliva

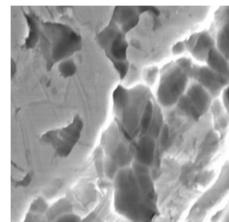


Fig. 2 - SEM (x5000) before immersion in saliva

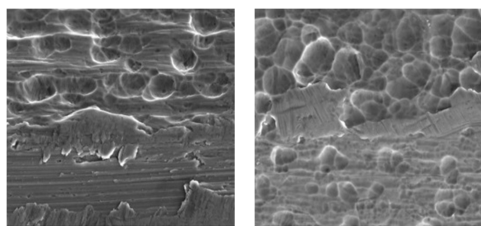


Fig. 3 - SEM (x2000) after immersion in saliva at pH 4 for 3 (a) and 5 (b) months

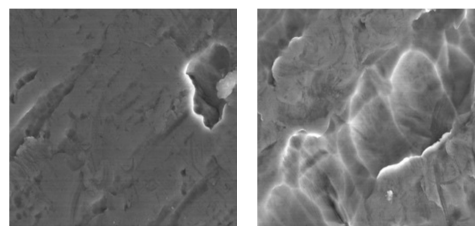


Fig. 4 - SEM (x5000) after immersion in saliva at pH 4 for 3 (a) and 5 (b) months

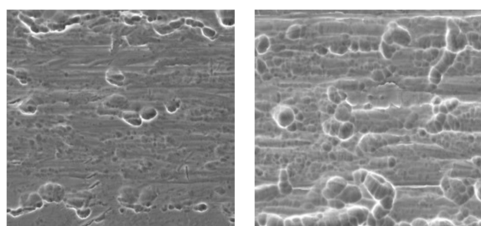


Fig. 5 - SEM (x2000) after immersion in saliva pH 6,75 for 3 (a) and 5 (b) months

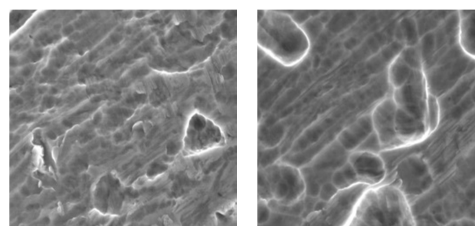


Fig. 6 - SEM (x5000) after immersion at pH 6,75 for 3 (a) and 5 (b) months

Regarding the immersion for the different pHs (4 and 6,75), the signs of irregularity are more evident in saliva with pH 6.75. In the magnification x5000 this finding is more noticeable.

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