

# #444 Possible Prevention of Post-Operative Hypersensitivity after Tooth Bleaching

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## Objectives

The purpose of this study was to investigate the possibility for prevention of post-operative hypersensitivity following tooth bleaching using an experimental single-bottle coating material.

## Materials and Methods

### Materials



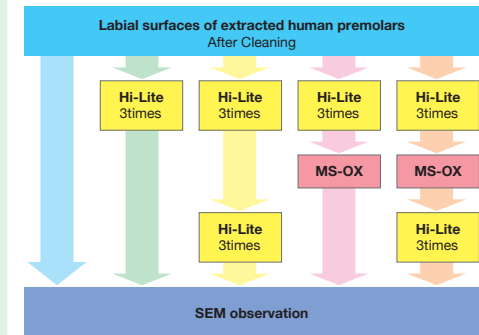
**Fig.1 Bleaching Material**  
**Hi-Lite (Shofu : JAPAN)**  
 35% Hydrogen peroxide solution  
 Catalyst with light (pH=4.1)



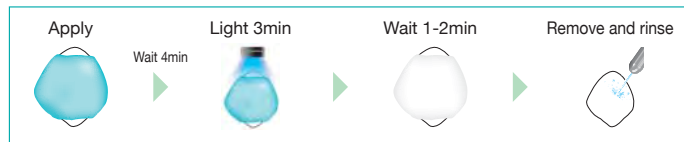
**Fig.2 Sealing Material**  
**Experimental MS-Ox (Sun Medical : JAPAN)**  
 Marketed as No-Mix Pain-Free by Parkell, U.S.A. in 2007  
 2.5% MS-polymer (emulsion)  
 1% Oxalic acid

Materials are used according to the manufacturers' instructions.

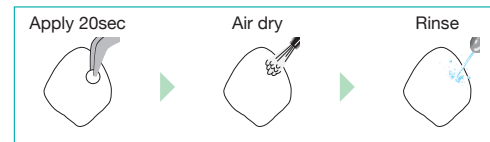
### Methods



**Fig.3 Methods**



**Fig.4a Bleaching procedure (Repeat 3 times)**



**Fig.4b Coating procedure**

## Results and Discussion

### Difference in shade

As shown in Table 1 and Fig.5, the average  $\Delta E$  values were  $9.7 \pm 3.6$  (with MS-Ox) and  $9.0 \pm 1.1$  (without MS-Ox). No significant differences in tooth shade were found between the bleached enamel surfaces with MS-Ox and those without.

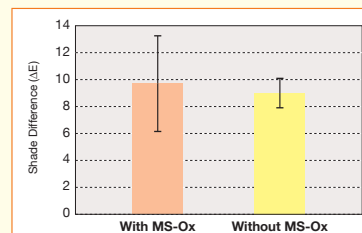
**Table 1 Differences in tooth shade between the bleached enamel surfaces**

	With MS-Ox	Without MS-Ox
$\Delta E$ value	$9.7 \pm 3.6$	$9.0 \pm 1.1$

$$\Delta E = \{ (L^*_2 - L^*_1)^2 + (a^*_2 - a^*_1)^2 + (b^*_2 - b^*_1)^2 \}^{1/2}$$

Before bleach:  $L^*_1, a^*_1, b^*_1$

After 2<sup>nd</sup> bleaching procedure:  $L^*_2, a^*_2, b^*_2$

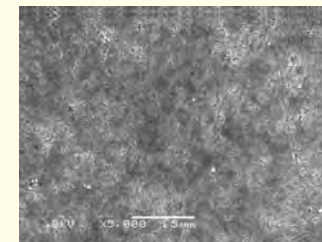


\* The data were analyzed by one-way ANOVA (p<0.05, n=8)

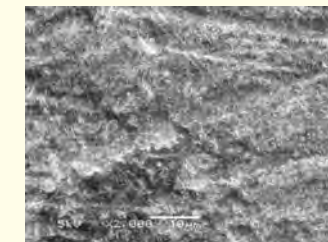
**Fig.5 Differences in tooth shade between the bleached enamel surfaces**

### Unbleached / bleached enamel surfaces

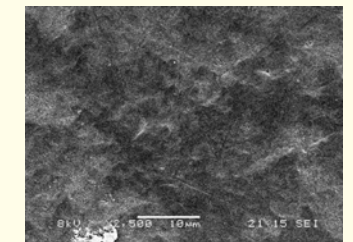
Using SEM, the unbleached / bleached enamel surfaces were compared (Figs 6-8). The bleached enamel surfaces were rougher and uneven. Microcracks were observed in both groups. It was suggested that these microcracks could be the pathways of external stimuli that provoke hypersensitivity.



**Fig.6 Enamel surface before bleaching**



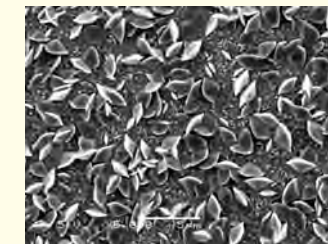
**Fig.7 Enamel surface after single bleaching procedure**



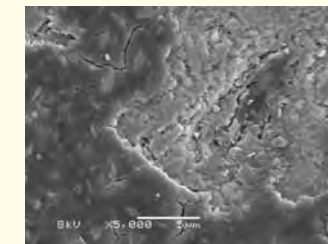
**Fig.8 Enamel surface after second bleaching procedure without application of MS-Ox**

### Effects of MS-Ox on bleached enamel surfaces

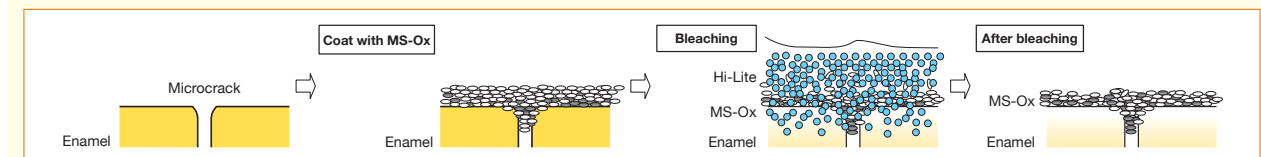
The coated enamel exhibited a unique surface consisting of a polymer film with 1-2 $\mu$ m petal-like and 0.2-0.3 $\mu$ m grain-shaped crystals. (Fig.9) The film consists of calcium oxalate and MS polymer. The polymer film seals the microcracks on the bleached enamel surfaces. It was partially exfoliated by re-bleaching, although the microcracks on the surface were kept sealed by MS-Ox. (Fig.10)



**Fig.9 Enamel surface coated with MS-Ox after single bleaching**



**Fig.10 Enamel surface coated with MS-Ox after single bleaching followed by another bleaching procedure**



**Fig.11 Mechanism of occlusion of microcracks by MS-Ox**

## Conclusions

The results of SEM observation demonstrated that the MS-Ox had a potential to seal the bleached enamel and prevent post-operative hypersensitivity following tooth bleaching without affecting the shade.