The Art and Science of Teeth Whitening

Prepared by:
Lec.Yasameen Hasan

Aim:

- *The aim of this lecture is to review the different systems of teeth whitening on the market, a chairside and take home bleaching, over-the-counter whitening products and how do we incorporate them into our work, the issues of tooth sensitivity, mechanism of action of bleaching materials and some of clinical cases.*

History

Commercialized Whitening began in the late 1980'S and today there are several different methods of teeth whitening on the market.

WHITENING TODAY

History

1877 - Chapple-Earliest recorded bleaching of vital teeth. His choice of material was Oxalic acid.

1879 - Taft and Atkinson used chlorine for bleaching vital teeth.

1884 - Harlom published the first report of the use of peroxide in bleaching (hydrogen dioxide).

History

Early 1900's - Practitioners began trying different ways to enhance the bleaching process. These included electric currents and UV waves. This was followed by the use of heat (+ light). Heat speeds up the breakdown of hydrogen peroxide.

1950's It became a common procedure to use 30% hydrogen peroxide and sodium perborate in a sealed pulp chamber. This is quite effective in that it works from the "inside out".

History

1941 - Raper used Hydrochloric acid for whitening teeth.

1937 - Ames demonstrated hydrogen peroxide effectiveness in bleaching mottled enamel.

1970 - Cohen reported the use of hydrogen peroxide in treating tetracycline stained teeth.

History

1986 - Croll used hydrochloric acid and hydrogen peroxide in combination to eliminate "white spot" lesions in children.

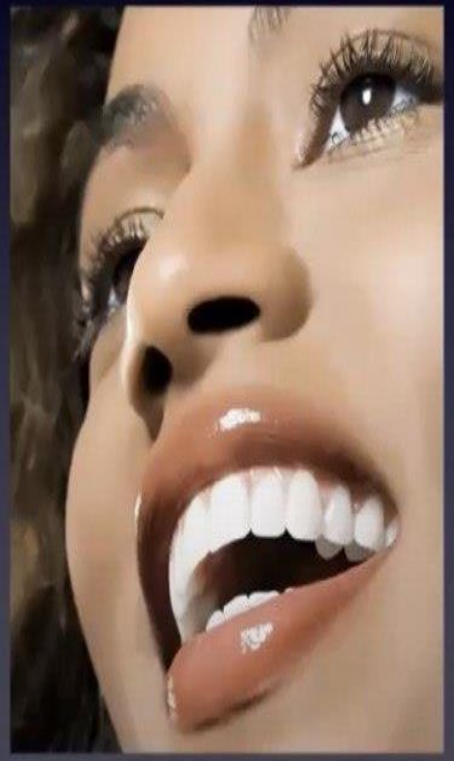
1989 - Haywood and Heyman introduced the use of a nightguard vital bleaching system. This used a 10% carbamide (urea) peroxide solution.

2000 - Kugel published on the use of 6% hydrogen peroxide-impregnated polyethylene for 30 minutes twice daily.

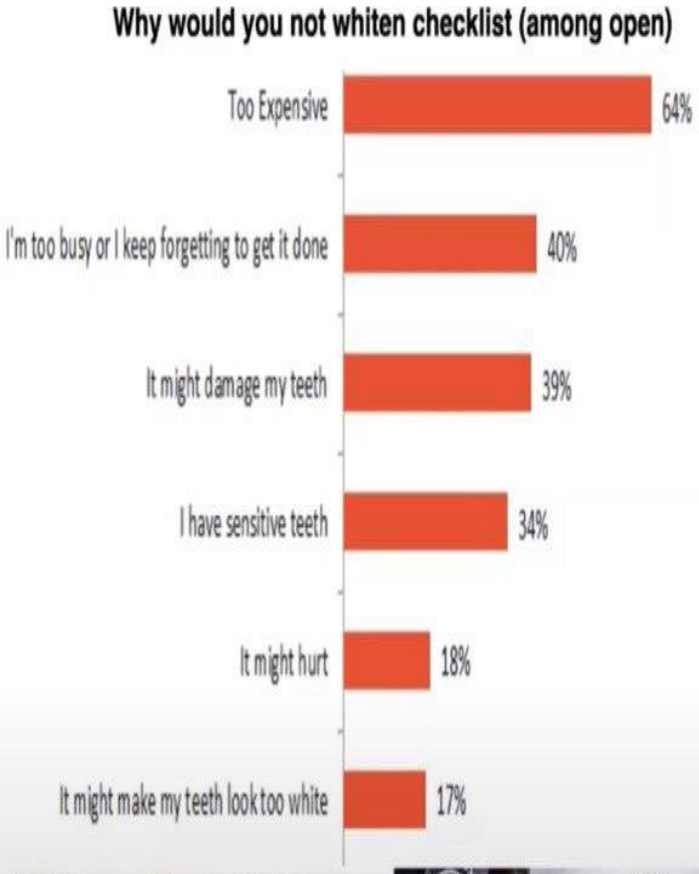
Dentists today can no longer expect patients to come to them; they must be proactive.

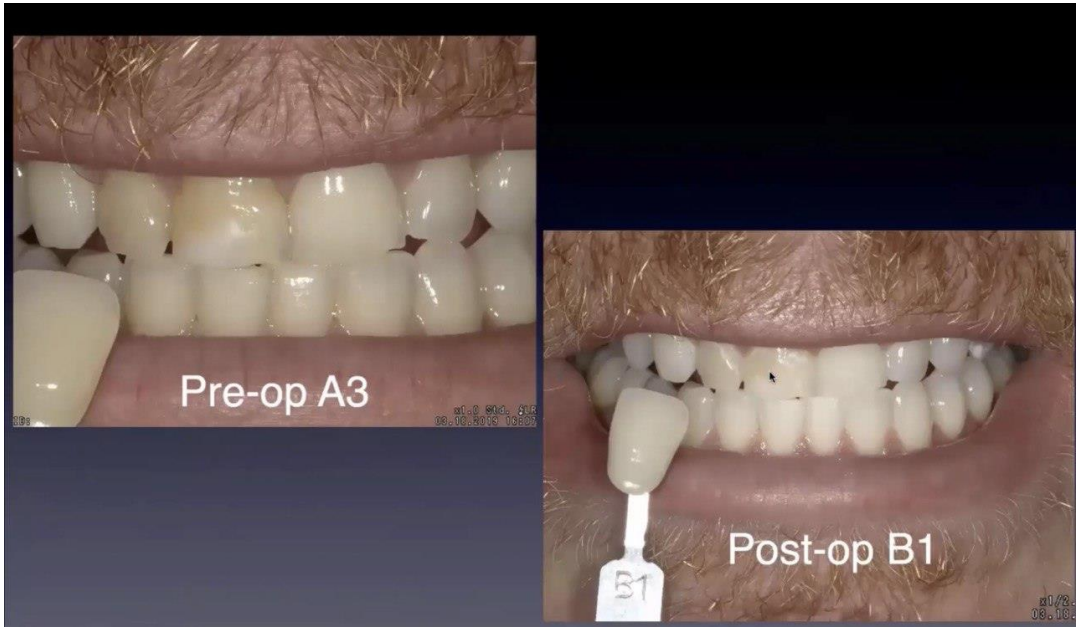
Identify Opportunities to Increase Production

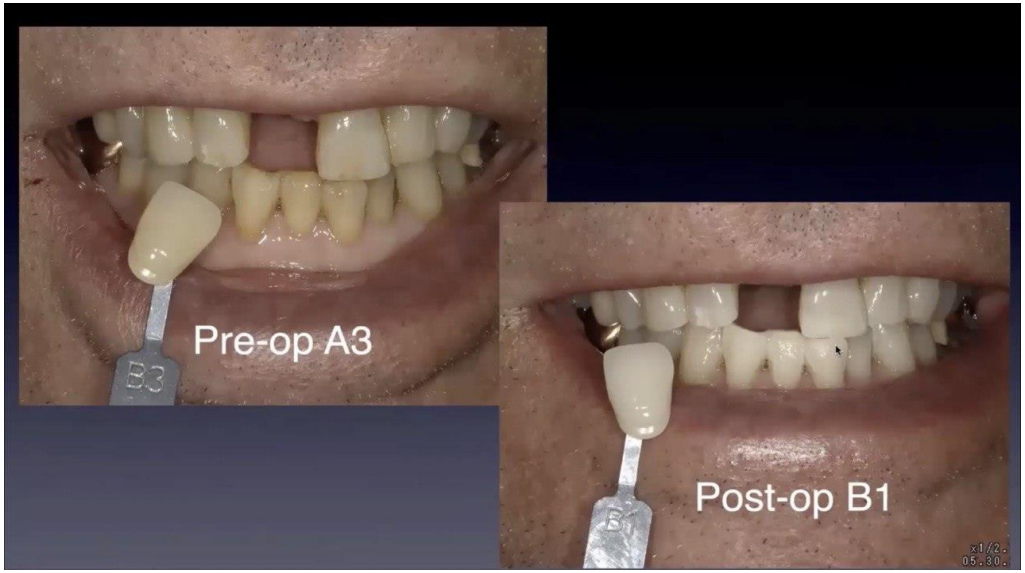
- Attracting new patients
- Providing more dentistry to established patients
- Adjunct to C&B procedures
- Service to your patients



When considering whitening, patients are concerned about price, time, safety and sensitivity.




Pre-op A3
Post-op B1
B1


Pre-op A3
B3
Post-op B1
B1

Whitening Options 2020

Stain removal

In-office bleaching*

At home bleaching*

Over the counter bleaching*

* Primary side effect for most people is transient tooth sensitivity

Howver , Whitening is not a pain free process

The biggest pain points of whitening include:

Sensitivity

Whitening today is known to cause tooth sensitivity and is a barrier to whiter teeth.

Inconvenience / Mess

Whitening trays are messy, cause you to drool excessively, and are a pain to clean.

Time consuming

Today's options range from 15-90 min of wear time with a tray.

For Dentist:

Tray Fabrication

Chair Time

The color of teeth is influenced by a combination of intrinsic color and the presence of extrinsic stain on the tooth surface

Why are teeth intrinsically yellow?

- Enamel is translucent
- Underlying dentin ranges from very white to very yellow
- Dentin continues to yellow as we age (~0.06 b* units / yr.)
- Other impacts:
- Medications (tetracycline)
- Trauma (blood)
- Non-vital

EXTRINSIC LOCATED OUTSIDE THE TOOTH

Tobacco

Foods

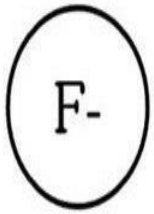
Coffee / Tea

Wine

Chlorhexidine

INTRINSIC LOCATED INSIDE THE TOOTH

Tetracycline



Fluorosis

Tooth Vitality

Tobacco

Age

Whitening Overview

Hydrogen Peroxide

- Breaks down quickly to oxygen & water
- Releases oxygen within a few seconds of contacting the tooth surface
- Permeates enamel & dentin

Whitening Overview

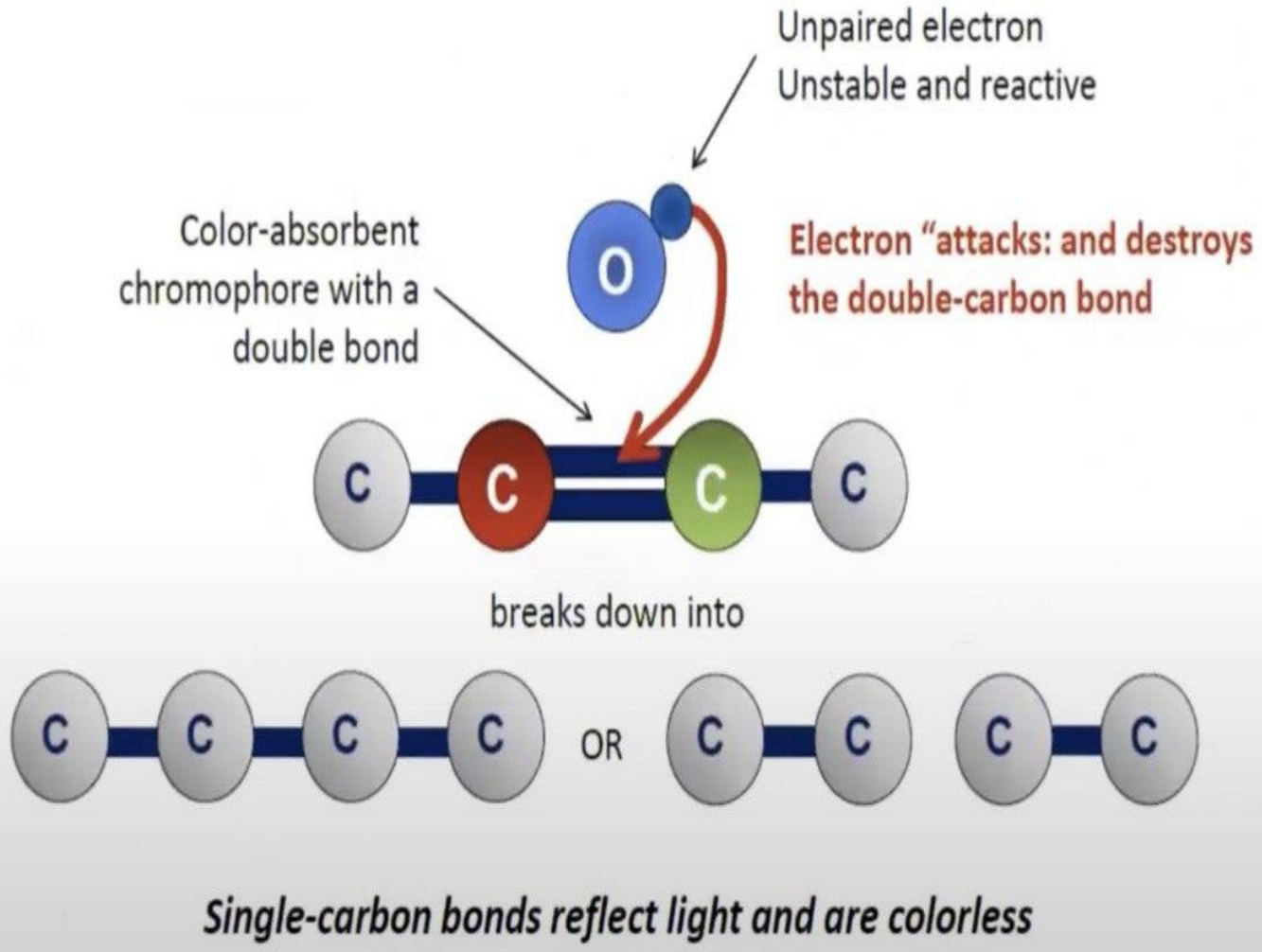
Carbamide Peroxide

- Fewer side effects and more chemically stable than hydrogen peroxide
- 10% carbamide peroxide produces 3.6% hydrogen peroxide
- Contains carbopal for Thixotropic quality

Chemistry

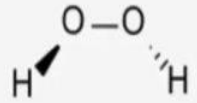
- Double carbon bonds which absorb light and hold chromophores are broken
- Single carbon bonds are formed and reflect light making the tooth appear lighter

How unstable electrons breaks down double-carbon bonds



Single-carbon bonds reflect light and are colorless

1



Hydrogen Peroxide

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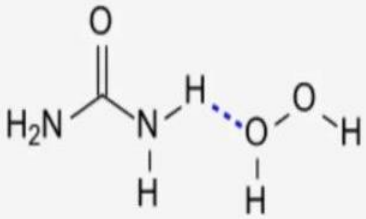
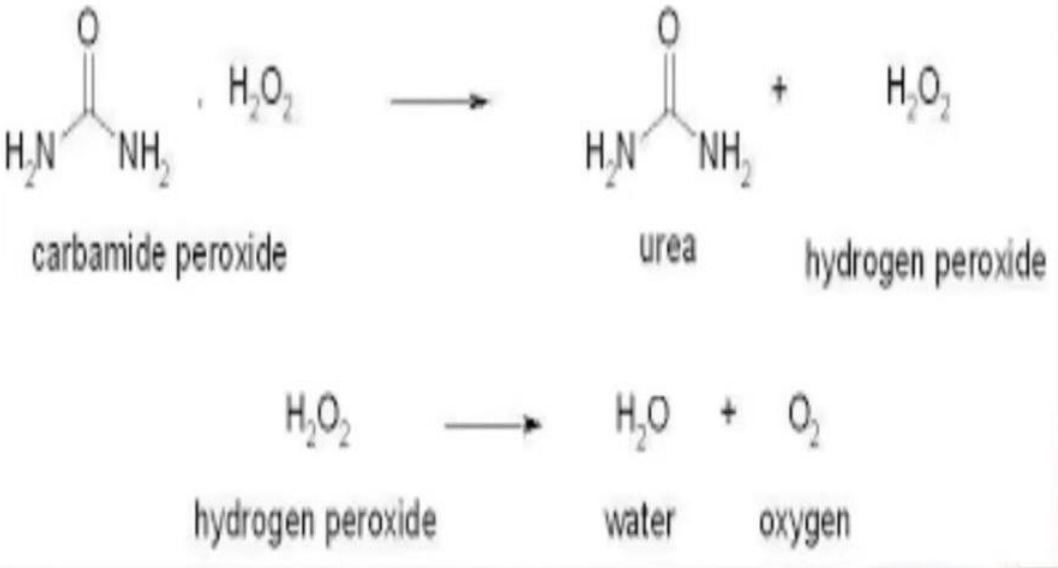


Carbamide Peroxide



New in-vitro study supports the absorption theory

"blue light irradiation significantly enhance the whitening process"

"the chromogen absorbs the photon, and then transfers the energy to the hydrogen peroxide (resulting in the cleavage)"

"raise the energy states of the (carbon) bonds in the chromogen making them more reactive with the hydrogen peroxide molecules"

N. Young, et al, 2012

ARTICLE IN PRESS

Available online at www.sciencedirect.com

SciVerse ScienceDirect

journal homepage: www.intl.elsevierhealth.com/journals/jden

A study of hydrogen peroxide chemistry and photochemistry in tea stain solution with relevance to clinical tooth whitening

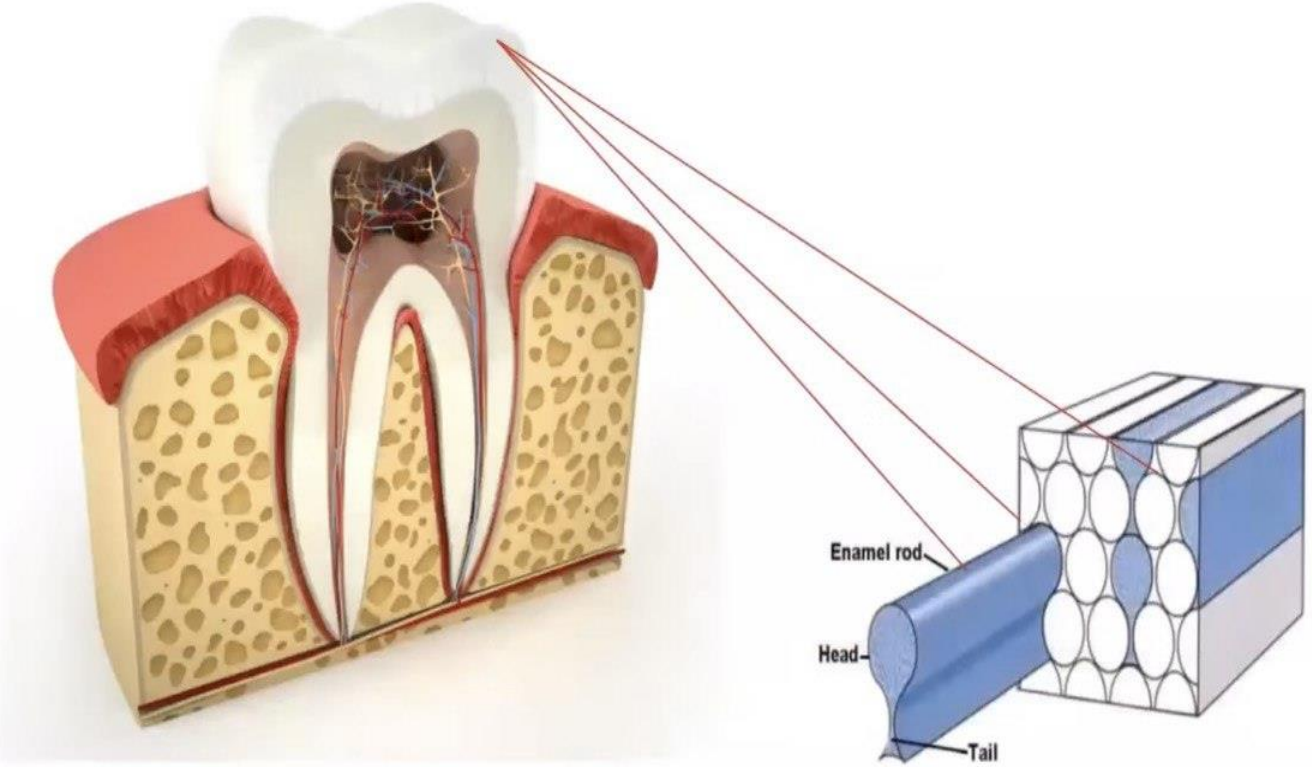
Nigel Young*, Peter Fairley, Veena Mohan, Coline Jumeaux

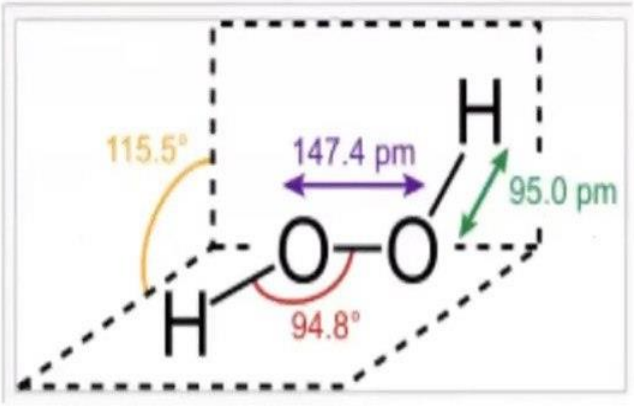
Philips Research Laboratories, 101 Cambridge Science Park, Milton Road, Cambridge CB4 0FPE, UK

ARTICLE INFO

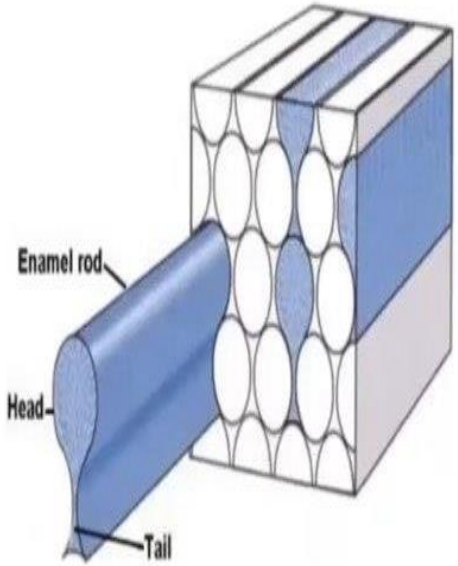
ABSTRACT

1. Introduction

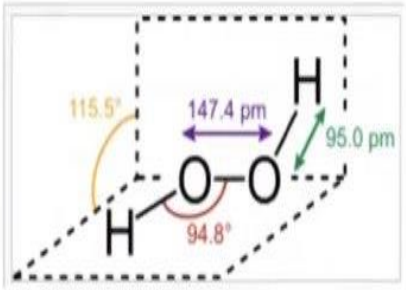




Enamel prisms spacing ~0.1μm



Enamel prisms spacing ~0.1μm



H2O2 = 115x150 pm

1 μm

micrometer

=

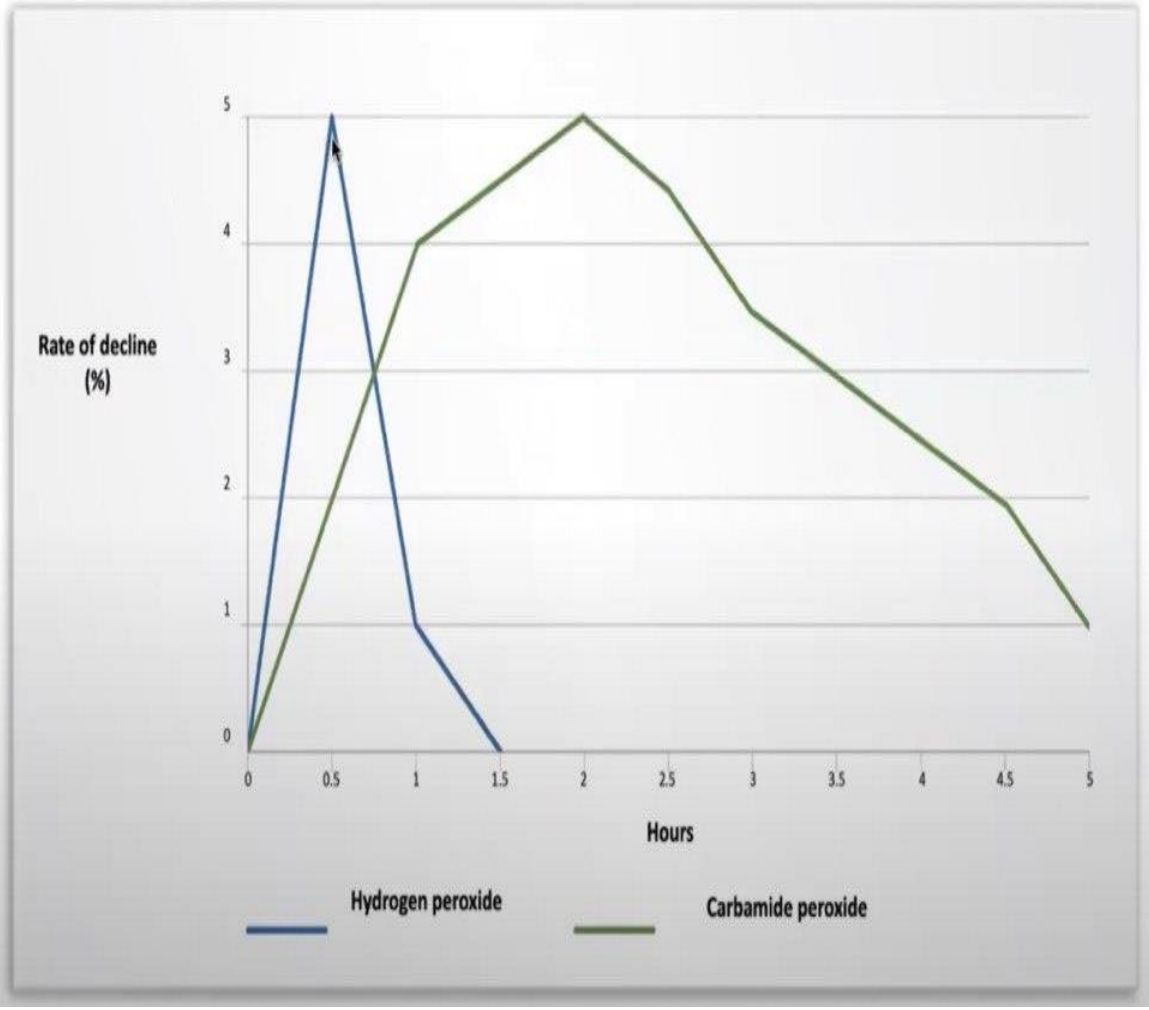
1,000,000 pm

picometer

- Hydrogen peroxide would be 150 inches wide (12’6”)
- Space between Enamel Rod would be 1.78 miles wide

How take-home whitening works

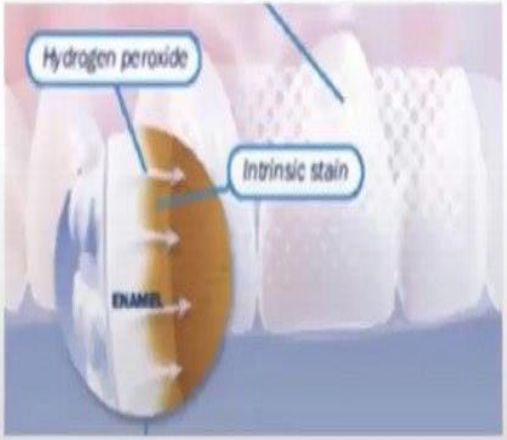
Difference between hydrogen and carbamide



Keys to Whitening Results

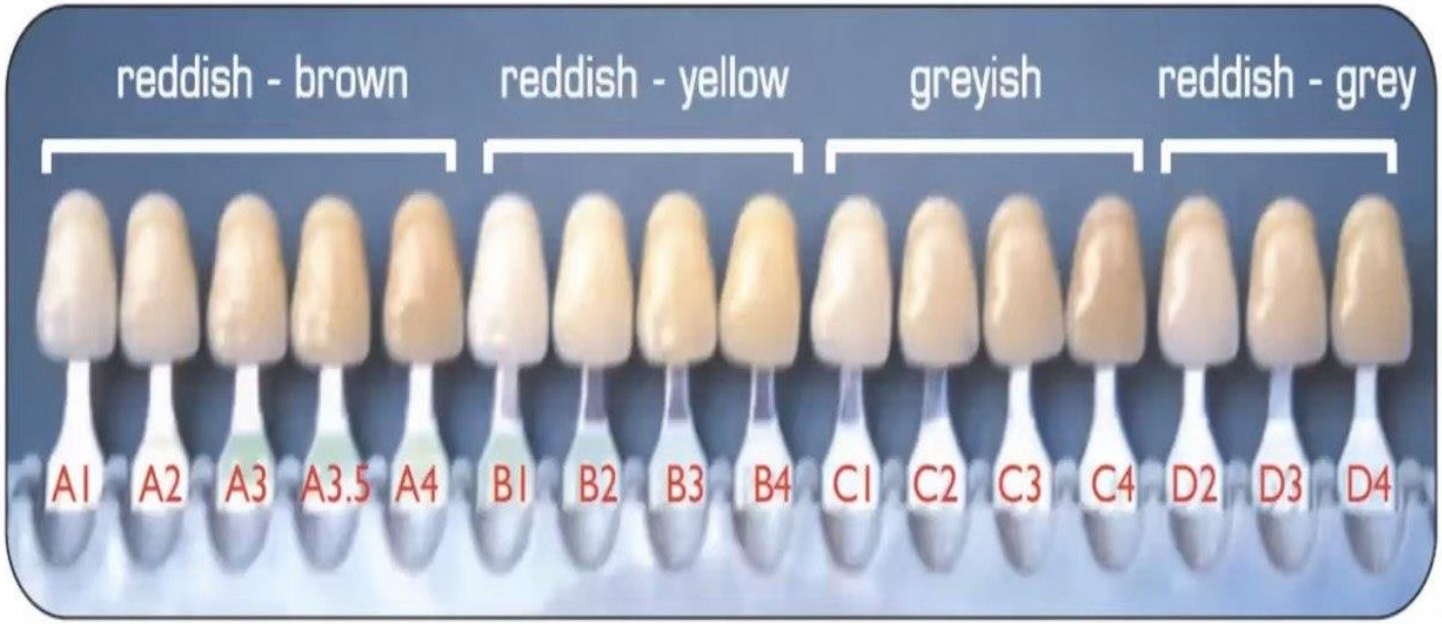
- Concentration
- Contact time with hard tissue
- Diffusion of whitening ingredient below tooth surface

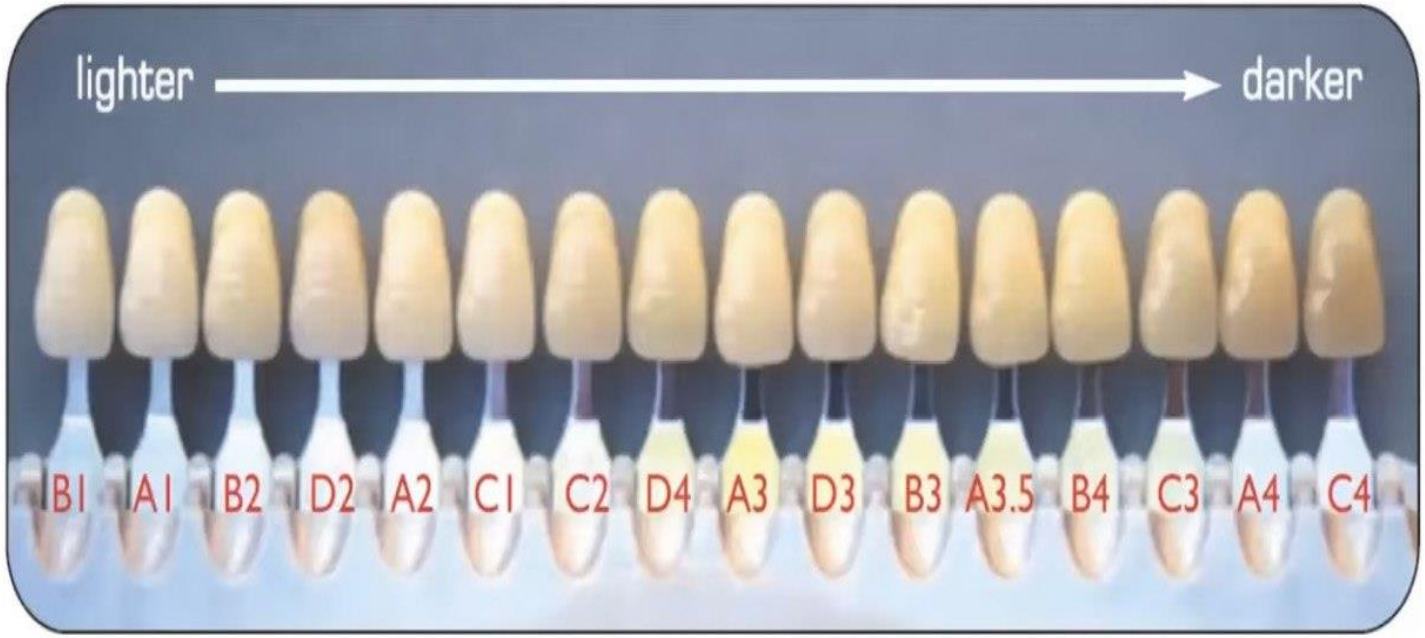
Concentration + Contact Time = Results



Enhancing H_2O_2

&


reddish - brown
reddish - yellow
greyish
reddish - grey
A1 A2 A3 A3.5 A4 B1 B2 B3 B4 C1 C2 C3 C4 D2 D3 D4


lighter
darker
B1 A1 B2 D2 A2 C1 C2 D4 A3 D3 B3 A3.5 B4 C3 A4 C4

Zoom Procedure

Retractor

Wave the light guide to cure resin & prevent excess heat

Zoom Light

Before

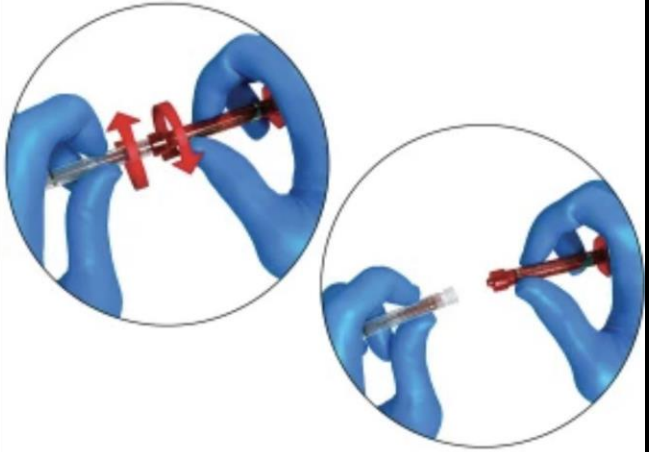
After

Opalescence Boost

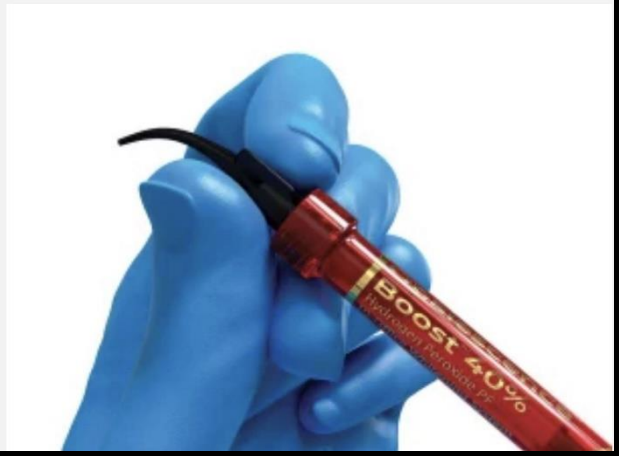
Step 2

Step 1

Step 3



Step 4



Step 5

Step 6

Step 7

Step 8

Step 9

Step 10

Step 11

Step 12

PREMA Micrabrasion and Zoom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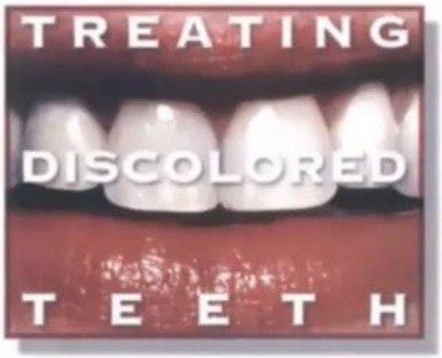
Opaluster



ENAMEL MICROABRASION: OBSERVATIONS AFTER 10 YEARS

THEODORE P. CROLL, D.D.S.

ABSTRACT

Enamel microabrasion has become accepted as a conservative, nonrestorative method of improving the appearance of teeth with

Enamel microabrasion is a proven method of removing intrinsic, but superficial, discolored mineralization defects from teeth.[1] Since the method was developed in the mid-1980s, much has been learned about the procedure and its long-term results.

Brue S., Park A., Kugel G. *Comparing Microabrasion Techniques for In Vitro White Spot Lesion Removal.* Journal of Dental Research, 93:891, 2014.

Brue S., Finkelman M., Harsono M., and Kugel G. *Microabrasion Techniques for Removal of In Vitro Enamel Demineralization*. Journal of Dental Research, 92:3255, 2013.

Concentration variety for Tray Whitening

6%, 9.5%, 14%HP

Concentration variety for Tray Whitening

10%, 16%, 22% CP

Figure 1: Non-vital tooth discoloration of the tooth 21.

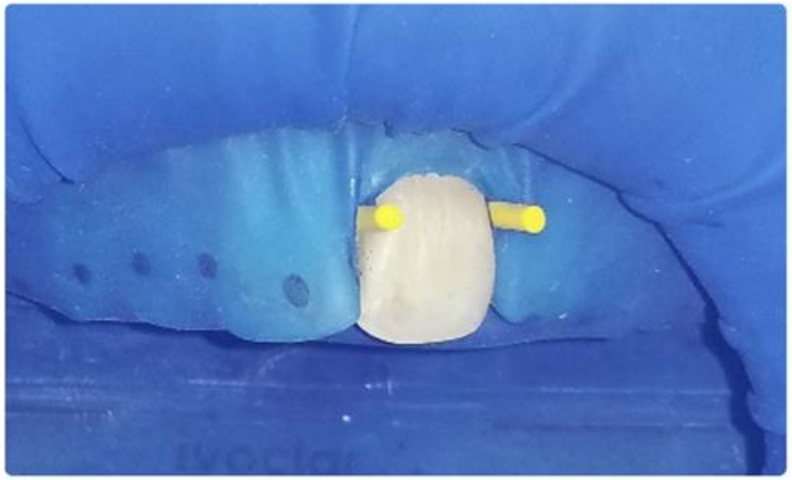


Figure 4: Rubber dam isolation.

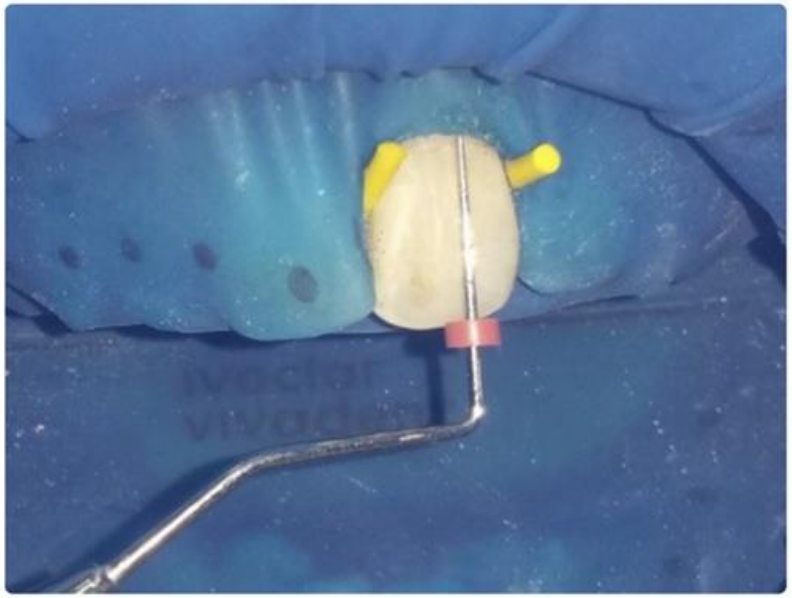


Figure 5: The distance between the CEJ and the incisal edge is measured with a periodontal probe.

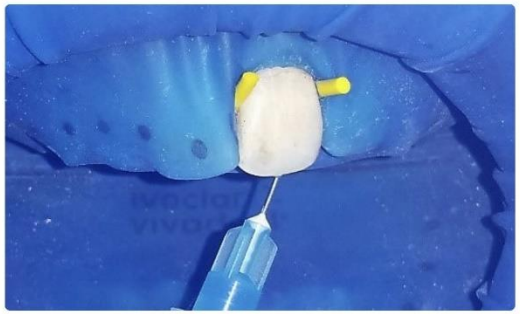


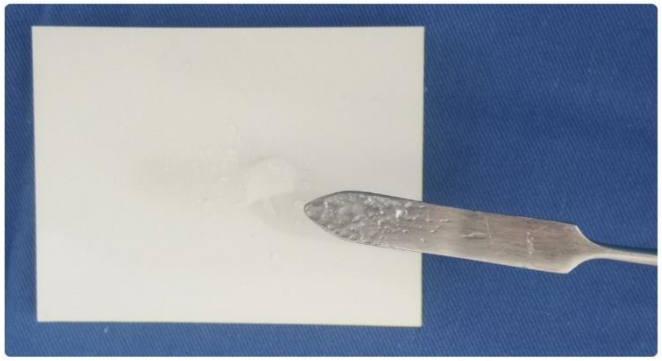
Figure 8: Using 37% phosphoric acid gel to remove the smear layer on the dentinal surface of the pulp chamber.

Figure 7: Removing the gutta percha root canal filling material with a round ended, long shank bur below the CEJ and placing a cervical barrier of 2mm thickness with glass-ionomer cement to protect the periodontal ligaments from the diffusion of the bleaching agent.

Figure 21: Opening the cavity access and removing the gutta percha root canal filling material to 2 mm below the CEJ.

Figure 22: The bleaching agent used was a mixture of sodium perborate and distilled water. Then, Cavit was used as a temporary filling material.

Figure 9: The bleaching agent used Endoperox kit (100 % carbamide peroxide). Kit containing: 1 x 5 g bottle of powder, 1 x 5 ml flask of glycerol and 1 measuring spoon.



Figures 10, 11, 12: Making a paste by mixing two spoonfuls of powder with 1 drop of glycerol to a firm consistency then placing the mixture into the pulp chamber.

Safety

More than one hundred published articles before 1990, and an additional 200+ since that time, attest to the safety and non-toxicity of whitening materials.

But what about tooth sensitivity?

- Yes, it happens
- Yes, it goes away
- It's not harmful
- Current belief: Directly related to rate of whitening and solely related to peroxide
- Reality: The **gelling and adhesive agents also contribute to sensitivity through dehydration.** This is true for **ALL** current effective whitening products.

Side Effects

- Transient sensitivity of the teeth to cold
- Irritation of the gingival tissues
  - Can occur alone or together
  - Duration is usually one to four days
  - All side effects stop when treatment is terminated

Treatment of Sensitivity

Passive Treatment

- Reduce wear time
- Reduce frequency of application (skip a day or two).
- Reduce the concentration of material (from 16% to 10%).

Sensitivity Treatment Options

Amorphous Calcium Phosphate Products

- Block tubules and prevent fluid flow

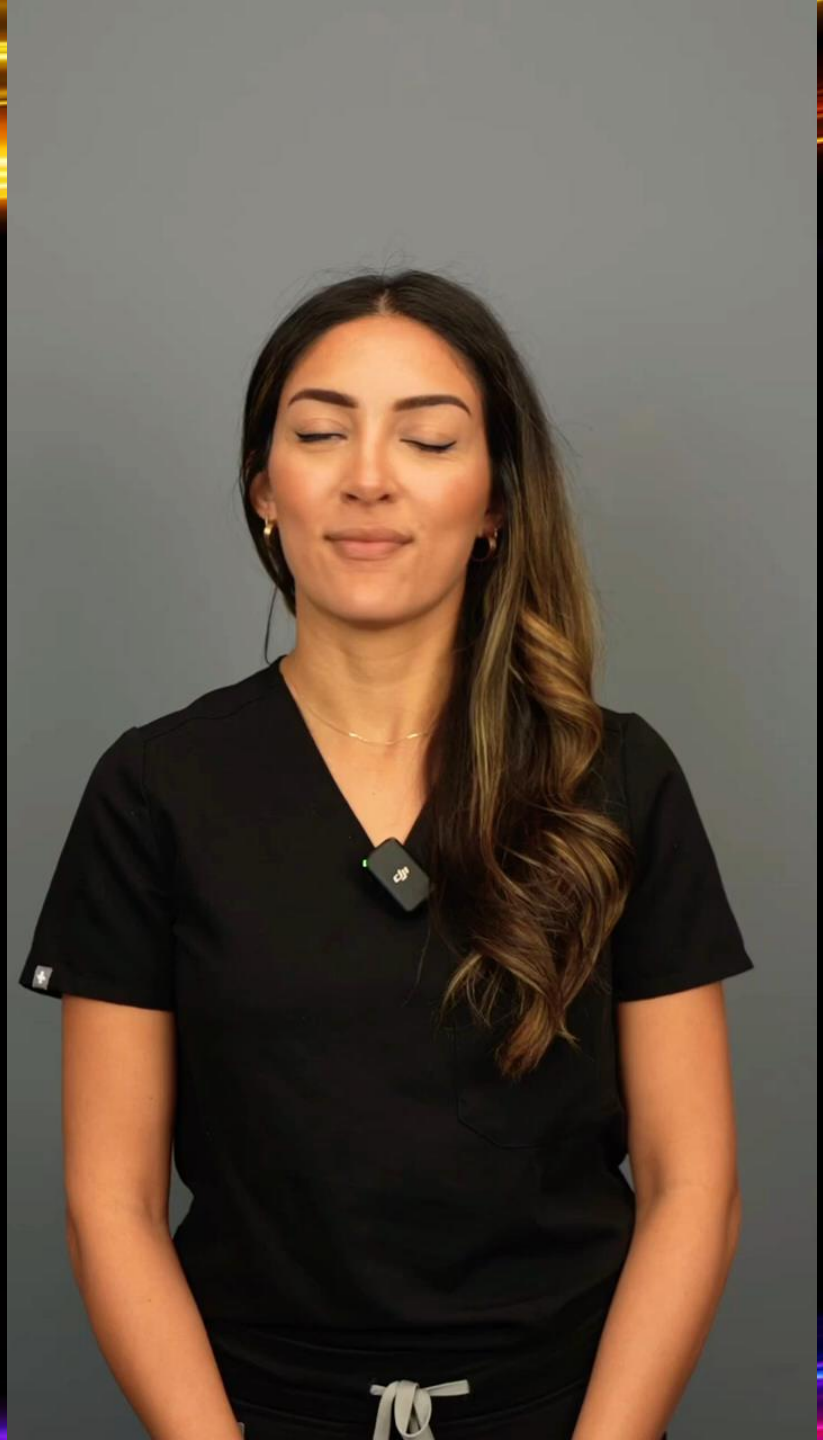
Fluorides

- Tubule blocker
- Affects transmission of fluids

OTC Products

Whitening Toothpaste?


WHITENING TOOTHPASTE
TEETH BRIGHTENING
V34 colour corretor serum
30ml | 1 fl oz
hismile
hismile
V34
Colour Corrector Serum
30ml | 1 fl oz
PRESS
Press the design
Quantitative release
BEFORE
AFTER



Crest Whitestrips

Advanced Seal

Pro Effects

Advanced Seal contains 9.5% hydrogen peroxide. The strips are used once per day for 14 days
Pro Effects contains 10% hydrogen peroxide. The strips are administered 2X per day for 10 days.

Comparative Performance of Two Whitening Systems in a Dental Practice

Ronald Perry, DDS, MS; Erinn Conde, BS· Svetlana Farrell, DDS, PhD; Robert W. Gerlach, DDS, MPH

A randomized, controlled clinical trial with 44 subjects was conducted to compare the safety and whitening efficacy of high-adhesion tooth whitening strips to a marketed in-office professional tooth whitening system.

Compendium July 2013

Summary

In this dental practice research, both the high adhesion 9.5% hydrogen peroxide whitening strips 2 hrs/day for 10 days and 25% hydrogen peroxide light-aided in-office system yielded significant post-treatment tooth color improvement

ON THE GO

- ✓ Use it anytime, anywhere
- ✓ Perfect for your purse, pocket or briefcase
- ✓ No bathroom or mirror required

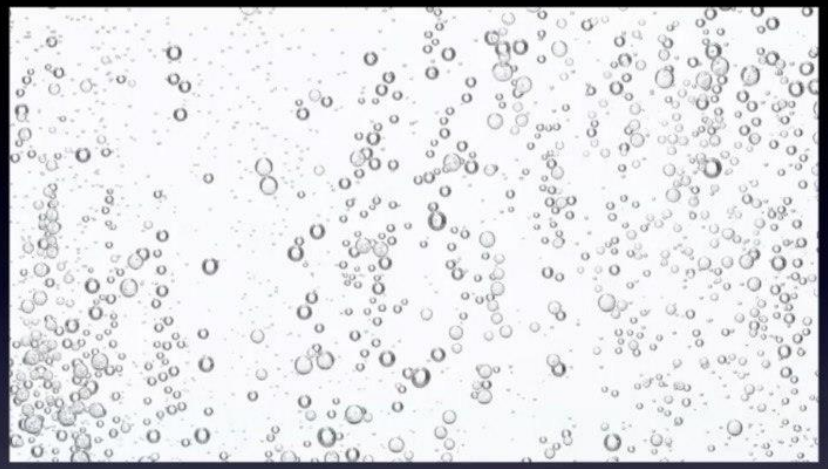
ON THE COUNTER

- ✓ Swipes on in seconds with whitening wand
- ✓ Incorporates within existing beauty routine
- ✓ Whitens between the cracks

LED LIGHT

- ✓ Whitening Emergency Kit
- ✓ Confidence Booster
- ✓ Integrates into Beauty Self Care days

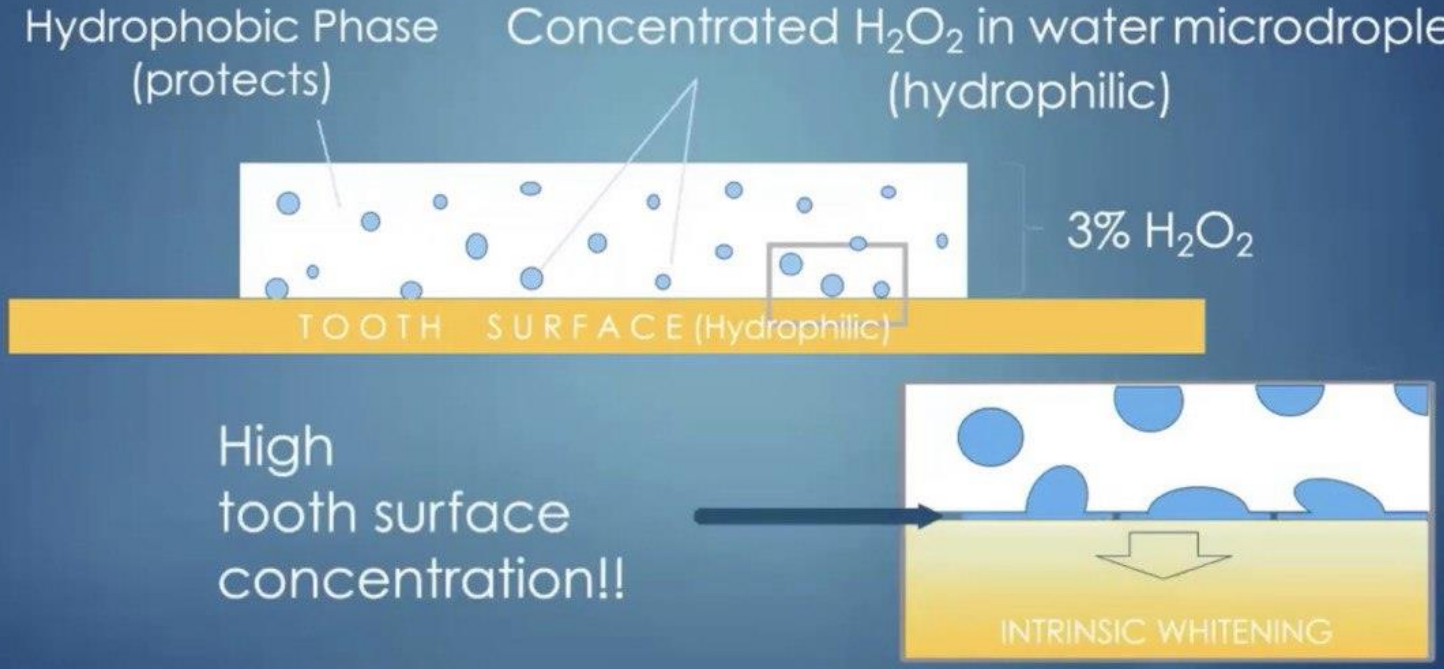
Crest
WHITENING EMULSIONS

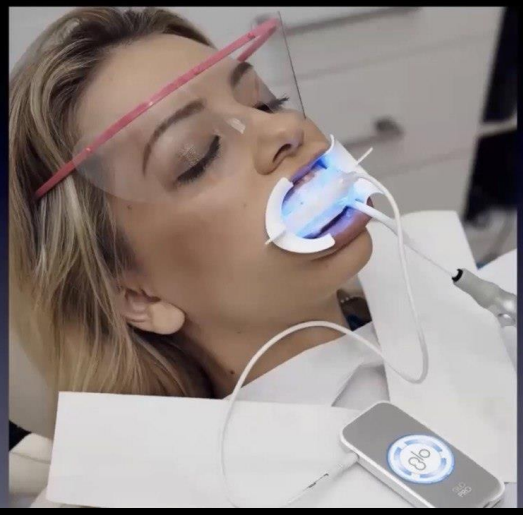


In the case of Emulsion, it is water + peroxide droplets coated with petrolatum.

Inside the small bubbles are concentrated peroxide and water and the whit area around the droplets is the petrolatum phase.

Emulsion Mechanism of Action





Kiosk Bleaching

- **Unique formula** provides comfortable, extended contact time
- Precision application, designed for **no sensitivity**

- Shorter LED wavelength delivers **more energy** to tooth stains for **better & faster whitening**
- **Rechargeable device** delivers consistently stable output

Thank You