ORIGINAL ARTICLE

Phosphorescent wax - The novel approach of innovation

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ABSTRACT

The present invention relates to dental compositions that include a phosphorescent material, more particularly, adding phosphorescent material to waxes that used in dentistry. The aim of the study is to develop a wax that has innate phosphorescent properties. Three groups of samples were taken in which the phosphorescent material was added. Three groups were later compared for their phosphorescent property in the material. All the samples in the initial molten state were poured into a mold made of silicone impression material and allowed to set. The material was placed in a dark room, and visual examination was done to compare the materials. From the samples obtained, paraffin wax showed more phosphorescent property than beeswax. The least phosphorescent property was seen in marginal wax. It can be concluded from this study that paraffin wax showed the most phosphorescent property.

Key words: Beeswax, innovation, luminous paint, marginal wax, paraffin wax, phosphorescence, resin, wax, yeti solidus wax

INTRODUCTION

Waxes are thermoplastic materials that are solid at room temperature but melt without decomposition to form mobile liquids. They may be natural or synthetic. They usually consist of two or more components. A variety of waxes are being used in dentistry for specific and well-defined purposes.[1]

The present invention relates to dental materials that include a phosphorescent material, more particularly, adding phosphorescent material to waxes that used in dentistry.

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Phosphorescence is related to fluorescence and is a type of photoluminescence.[2] The difference between phosphorescence and fluorescence is that there is no immediate re-emission of radiation absorbed by the material.[3] In quantum mechanics, forbidden energy state transitions are associated with slower time scales of the re-emission.[4] The absorbed radiation is re-emitted at a lower intensity for up to several hours after the original excitation as these transitions occur very slowly.[5]

A material can incorporate no less than one polymerizable material and no less than one luminous material.[6] It can be formulated according to the procedure to be done and also be capable of phosphorescing.[7,8] This material can be used by application over a tooth/cast and irradiating it with a light source.[9] Accordingly, phosphorescence can aid dental professionals in examining the laboratory work.[10] Since this material is soft at room temperature, it can easily adapt into minimal thickness regions to give a technician a better perspective regarding the fit of the prosthesis.

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Our research and knowledge have resulted in high-quality publications from our team.[11-33] The aim of the study was to develop and compare waxes for their innate phosphorescent properties.

MATERIALS AND METHODS

Three groups of samples were taken in which the phosphorescent material was added. In Group 1, marginal wax with radium liquid in 3:1 ratio has been used. In Group 2, paraffin wax with radium liquid in 3:1 ratio has been used. In Group 3, combination of beeswax, yeti solidus wax, and radium liquid in 3:3:1 ratio has been used.

A metal container was placed in the water bath maintained at a temperature of 83°C. A clear, plastic stirrer was used to melt the wax. Both the container and the stirrer were sterilized prior in order to maintain a sterile environment. The required drops of wax was taken and mixed outside the water bath. All the samples in the molten state were poured into a standard mold made of silicone impression material and allowed to set.

Three groups were later compared for their phosphorescent property in the material. The material has been subjected to illumination for 20 s and examined in a dark room. Visual examination was done to compare the materials.

RESULTS

From the samples obtained, Group 2 showed the most phosphorescent property followed by Group 3 and Group 1 [Figures 1-3]. However, Group 2 was very brittle and had a setting time of 60 min. Group 1 had a setting time of 3 min and was very hard. Group 3 showed a greater amount of shrinkage [Table 1].

DISCUSSION

Phosphorescence might help in better visualization of defects that are present in the tooth or cast.[2] However, the waxes currently available in the market do not have any phosphorescent properties.

Phosphorescence is the ability of the object to absorb natural light and emit on its own.[4] Paraffin wax is a soft wax used basically to produce candles; these waxes are used in extensive range and are used as a mix with dentistry.[34] Carving wax is one of the most resilient waxes used in dentistry to make crown markup models.[35] Beeswax is

Table 1: Table depicting the phosphorescence, hardness, setting time and shrinkage of the waxes in 3 groups

Wax	Phosphorescence	Hardness	Setting time (min)	Shrinkage
Group 1	Low	High	3	Low
Group 2	High	Low	60	Low
Group 3	Low	High	5	High

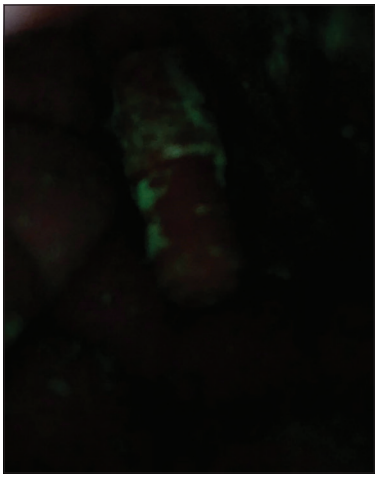

Figure 1: Group 1: Marginal wax with luminous liquid

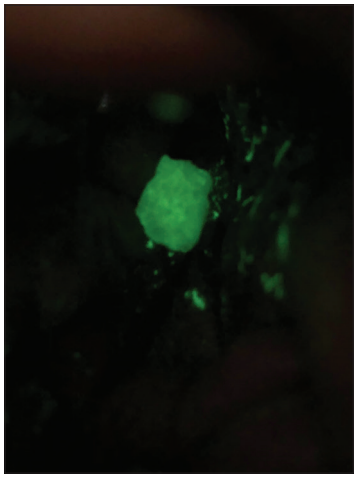

Figure 2: Group 2: Paraffin wax with luminous liquid

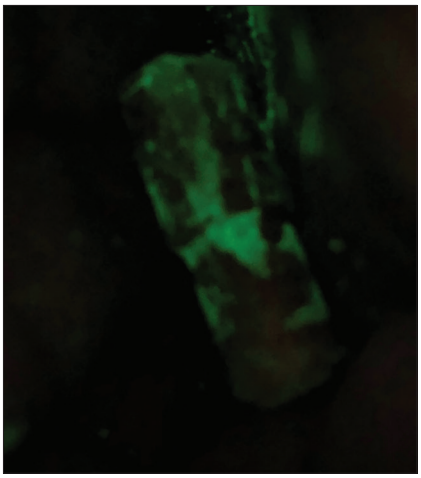

Figure 3: Group 3: Yeti solidus wax with beeswax and mixed with luminous liquid

another wax used for candle making, similar to paraffin wax. However, it is said that beeswax is much more resilient than paraffin wax.[36]

A dental material can include at least one polymerizable resin and at least one phosphorescent material in its composition.[37] It can be formulated to blend with a person's tooth and also be capable of phosphorescing.[38] This material can be used by application over a tooth/cast and irradiating it with a light source.[39] Accordingly, phosphorescence can aid a dental professional in distinguishing between the location of the dental composition and the tooth.[40]

Waxes are one of the most important aspects used in dentistry, used in different fields of dentistry. In this study, radium liquid was used to mix with different wax samples to make a material which can exhibit phosphorescent properties. These properties can have an advantage in dentistry in many fields such as for wax mockup models and also for other potential patient mockup models.[41]

This study was limited by the use of radium liquid which did not mix well with the waxes. Use of radium powder might have shown better characteristic properties. In addition, the phosphorescence was visually analyzed. Not digital confirmation was used. The luminous paint that has been used was difficult to mix with the wax, and hence, a smooth finish was not obtained with the final material which is a very important quality of wax.

CONCLUSION

Within the limitations of this study, out of observed groups, Group 2 shows more phosphorescence than in Group 3 and even better than Group 1. Further studies need to be done to assess the clinical usage of this wax.

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Conflicts of interest

There are no conflicts of interest.

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