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Application of Left Circular Polarized Light for Polymerization of Biodur P_{40}

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Biodur P_{40} is a UV light cured polyester Co-polymer that is used for making of brain slices. Ultraviolet light is the usual factor for curing the polyester. We use a device constructed by us for hardening stage of procedure. There are many worldwide attempts to apply other sources of light. The purpose of this study is to test the effect of left-rotating circular polarized light on polymerization of Biodur P_{40}.

Key words: plastination, left-rotating circular polarized light, Biodur P_{40}, UV

Introduction

Plastination is a new method for durable preservation of anatomical preparations. The plastinators use some basic methods in their work. S_{10}, E_{12}, P_{35} and P_{40} are modern plastination techniques for production of safety and life like anatomical preparations. Biodur P_{40} is a UV light cured polyester co-polymer that is used for making of brain slices [7]. Ultraviolet light is the usual factor for curing the polyester [1]. We use a device constructed by us for hardening stage of procedure (**Fig. 1**). It has four lower and two upper ultraviolet tube manufactured by Phillips.

There are many worldwide attempts to apply other sources of light [3]. They are described by *Robert Henry* [4]. In China, Thailand and Carolina (USA) the materials that are used work at room temperature after being mixed with chemical hardener [5, 6, 8].

Fig. 1. A UV light source used to solidify brain plates.

In our previous studies [9], we had been successful in applying sunlight as the hardener of the polymer. This is an economical method, but the procedure is slow and the process is more difficult to control.

The purpose of this study is to test the effect of left-rotating circular polarized light on polymerization of Biodur P_{40}. The light is an electromagnetic wave, but the polarization light is a state in which the electric field has a constant magnitude [10].

To accomplish this goal, we set out the following main tasks:

- ✓ Detecting the action of circularly polarized light with a yellow filter;
- ✓ Detecting the action of circularly polarized light with a red filter;
- ✓ Detecting the action of circularly polarized light with a green filter;
- ✓ Detecting the action of circularly polarized light with a violet filter;
- ✓ Detecting the action of circularly polarized light without a filter;
- ✓ Control reaction with sunlight.

Material and Methods

We used standard resin Biodur P_{40}, manufactured by *Biodur*^{TM}, *Heidelberg*, *Germany*. For better visualization of the polyester fluid, we added colorants in different versions as follows:

- ✓ Hematoxylin;
- ✓ Eosin;
- ✓ Eosin in acetone;
- ✓ Without coloring.

The source of left-turning circularly polarized light is our construction, made from an old dia-projector with an attachment for removable filters of different color (**Fig. 2**).

We used several filters with different color and different band width.

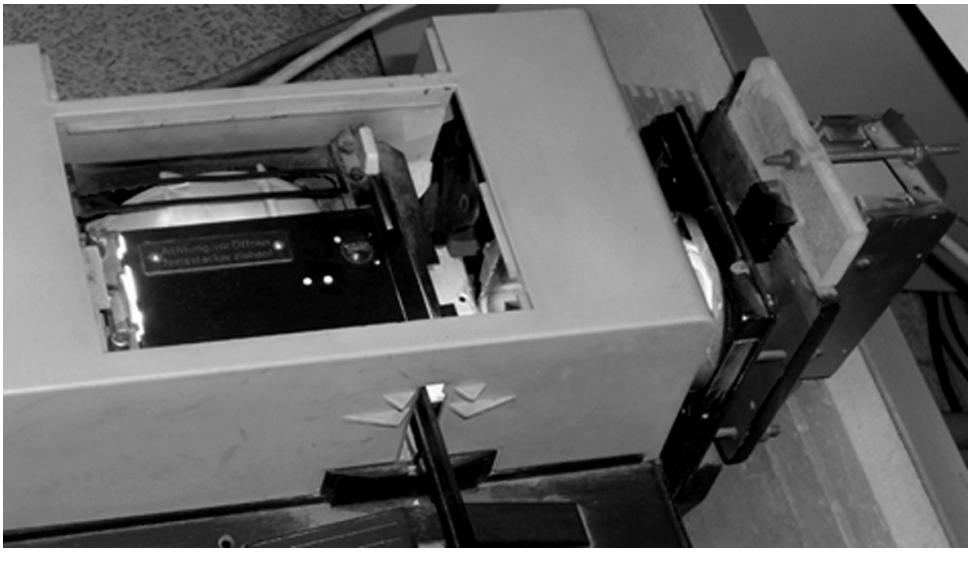

Fig 2. The light source.

Results and Discussion

The first sign of the beginning of the reinforcement is the appearance of a "mesh" in the polyester fluid. The grid appeared first in the polymer without a colorant, and soon after – in this stained with eosin in acetone. The results are presented on **Table 1**.

The results of applying different filters to a colorless polymer are shown in **Table 2**.

We can't compare our results with other authors because there are not similar investigations with circularly polarized light.

Final hardening occurred after 6-7 days. It turns out that the circularly polarized light causes a slow curing of the Biodur P^{40} but it is not enough for the needs of the practice. In the control reaction with sunlight, a network appears after 20 minutes.

Table 1. The grid appearance in the polyester co-polymer (in minutes).

No	**Polyester co-polymer BIODUR P_{40}**	**minutes**
1	Without a colorant	45
2	Tinted with eosin in acetone	60
3	Tinted with eosin	75
4	Tinted with hematoxylin	150

Table 2. The grid appearance in the polyester co-polymer (by filter color).

No	**Polyester co-polymer BIODUR P_{40}**	**minutes**
11	Without filter	30
22	Yellow filter	45
33	Violet filter	45
44	Green filter	135
55	Red filter	180

Conclusions

1. Left circular polarized light is not suitable for curing the Biodur P_{40} polyester co-polymer since the process is running too slowly.

2. The best and quickest cure is obtained by using ultraviolet rays of special lamps, which is suitable for practice (the process is described in another study).

3. The second most effective is the application of sunlight, but it is more suitable for initial polymerization of the material (the process is described in another study).

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