

بررسی میزان پلیمریزاسیون یک رزین باندینگ آزمایشگاهی کیور شده با LED توسط دستگاه DSC

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Title: Evaluation of polymerization of an experimental bonding resin cured with light emitting diodes using Differential Scanning Calorimetry

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Background and Aim: Extent of polymerization (Ep) is the rate at which methacrylate C=C bonds are converted to aliphatic C-C bonds. The higher the Ep value, the better the polymerization of the polymer. If the polymer dose not polymerize sufficiently, it could have destructive effects e.g. releasing monomer, initiator, free radical or insufficient polymerization of hybrid layer. Therefore, measuring the Ep value is very important. Light-emitting diodes (LEDs) are becoming increasingly popular in dental practice as they have a long life expectancy. LEDs do not generate infrared wavelength, and have a constant light output. Therefore, comparison of LED and Quartz tungsten halogen (QTH) from the point of Ep is important. Differential Scanning Calorimetry (DSC) is a proper tool for determining the Ep value, monitoring the process of reaction and reaction kinetics. The aim of this study was to measure the Ep value of a dental bonding containing camphorquinone/amine photoinitiator which were cured by LED and QTH using DSC.

Materials and Methods: In this experimental study, 2.5 mg of bonding material were placed in DSC aluminum pans. Two different light cures, LED & QTH (Coltene Company Coltolux ®75 LED Curing Light), were used in this study. The light guide was positioned at a distance of 9mm from the base of the sample chamber. Each sample was photopolymerized for 30 seconds, and the DSC curves were obtained after 100 seconds from initiation of photopolymerization of each sample, at both 23°C and 37°C. The heat of photopolymerization (ΔH) was calculated from the area under the peak of the differential temperature curve. Five samples were used for each condition. The data was analyzed by two-way ANOVA.

Results: There was highly significant difference between two temperatures in the experimental bonding (pvalue<0.001). Representative DSC curves showed the same kinetic behavior for LED and QTH.

Conclusion: The results revealed that the Ep generated by high power density QTH was the same as that of produced by second generation of LED.

Key Words: Bonding; Extent of polymerization; Light emitting diodes (LED); Differential Scanning Calorimetry (DSC)

چکیده

زمینه و هدف: میزان پلیمریزاسیون (Ep) به میزان تبدیل باندهای C=C متاکریلات به باندهای C-C آلیفاتیک گفته می‌شود. هرچه مقدار Ep بیشتر باشد پلیمریزاسیون پلیمر بهتر انجام می‌گیرد. اگر پلیمر به اندازه کافی پلیمریزه نشود می‌تواند اثرات مخربی از جمله آزادسازی مونومر، آغازگر و رادیکال‌های آزاد یا پلیمریزاسیون ناکافی لایه هیبرید داشته باشد. بنابراین اندازه‌گیری مقدار Ep اهمیت زیادی دارد. استفاده از دیودهای منتشر کننده نور (LED) در دندانپزشکی

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