

PHOTOPOLYMERIZERS. PRINCIPLES OF OPERATION AND ADVANTAGES. THE IMPORTANCE OF HALOGEN PHOTOPOLYMERIZERS TODAY

Khalilova Laziza Ravshanovna

Teacher of Asian International University.

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Abstract. A photopolymerizer is a high-intensity dental polymerization lamp that is designed for photopolymerization (rapid solidification) of a variety of composite filling materials and compomers. The photopolymerizer is an essential element of the dental institution's equipment, as it is one of the equipment for daily use.

Keywords: photopolymerizer, halogen lamp, LED lamps, radiometer

ФОТОПОЛИМЕРИЗАТОРЫ. ПРИНЦИПЫ РАБОТЫ И ПРЕИМУЩЕСТВА. ЗНАЧЕНИЕ ГАЛОГЕННЫХ ФОТОПОЛИМЕРИЗАТОРОВ СЕГОДНЯ

Аннотация. Фотополимеризатор — это высокоинтенсивная стоматологическая полимеризационная лампа, которая предназначена для фотополимеризации (быстрого затвердевания) различных композитных пломбировочных материалов и компомеров. Фотополимеризатор является важнейшим элементом оснащения стоматологического учреждения, так как относится к оборудованию для ежедневного использования.

Ключевые слова: фотополимеризатор, галогенная лампа, светодиодные лампы, радиометр.

Almost all sealing and restoration procedures require the use of light-curing materials.

Halogen and LED photopolymerizers are the most common. Halogen lamps, using the energy of electricity, are heated to a white color, harmful to the eyes. The dental polymerization lamp is one of the main devices used in restorative dentistry. Device generates bright light, which initiates polymerization of composite materials based on light-curing resins. Modern light-curing composites are sensitive to visible light with a wavelength of 350-600 nm. Lamps differ in technical characteristics and design features of the device shape, which determine the convenience of working with them. Modern polymerizers are equipped with a flow wavelength regulator. For halogen, plasma-arc, and laser models, the wavelength is adjusted in the range from 410 to 490 nm. LED lamps have a narrower wavelength range. Therefore, when choosing an LED device, you should focus on which photoinitiators are contained in the material used.

The power of the light stream depends on how well the materials will harden. The optimal operating power of the light flux is considered to be 450 watts. The higher the power dissipation density, the faster and deeper the solidification process of the material will occur.

The minimum value should be 1000 MW/cm². Depending on the power source, polymerization lamps for dental work are available in 2 configurations:

1. Wired (stationary). Such lamps are integrated directly into the dental unit. Therefore, when choosing them, it is important to pay attention to the compatibility of the lamp and the installation. The main advantage of stationary models is that they do not need to be charged.

Their work is carried out from the network.

2. Wireless (portable). These polymerizers are compact and have a small size and weight.

A halogen lamp is an incandescent lamp consisting of a tungsten filament sealed in a compact transparent bulb filled with a mixture of an inert gas with a small amount of halogen, such as iodine or bromine. Light is produced using a thin tungsten filament through which an electric current flows. At this point, the tungsten filament is a kind of resistor. Next, this resistor is heated to a temperature of about 3000 K, becomes incandescent and emits infrared and electromagnetic radiation in the form of visible blue light with a wavelength between 400 and 500 nm and an intensity of 400-600 MW/cm². A small glass bulb can be enclosed in a larger outer glass bulb for greater configuration; the temperature of the outer bulb will be much lower and safer, and it also makes it possible to protect the hot lamp from harmful contamination. To transmit the blue radiation spectrum from a halogen lamp to a sealing material, a fiber or monolithic fiber optic is required. The light passing through the fiber-optic cable is released at the tip of the fiber. The highest light intensity is located in the center of the light guide, and contamination of the end part of the light guide with sealing material and mechanical damage (chips, cracks) cause light scattering, reducing its power. Therefore, the tip of the light guide must be clean. It is also necessary to periodically measure the light power using an integrated or stand-alone radiometer. It is possible to transform the operating characteristics, leading to a decrease in the main indicators of the lamp: the energy luminosity of the outgoing stream decreases with an increase in the specific power of ultraviolet and infrared radiation, which can damage the skin of the doctor's and assistant's hands.

The dental halogen photopolymerization device consists of the following main components:

- power supply unit;
- polymerization process control unit;
- halogen incandescent lamp;
- selective light filter;
- light guide;
- heat dissipation system.

Additional components include

protective screens and caps, and light intensity monitoring devices such as radiometers.

The polymerization process control unit allows you to perform the following functions: set the time to turn off the polymerization light after 10-90 seconds, turn on the continuous polymerization mode.

The halogen incandescent lamp is the most important structural element in most photopolymerizers, it has a power of 75 watts. A selective light filter is available to transmit light in the range of 400-500 nm.

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