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APPLICATION NOTE APMD-01

Bonding of Balloon Catheters

Bonding of Balloon Catheters

Definition: A catheter is a thin plastic tube that can be inserted into the body to make measurements or add or remove fluid. For example, a catheter can be introduced into an artery and moved to a location in the heart to measure pressure changes.

There are many types of catheters:

- Neurovascular:** Pertains to either the neurological and vascular systems or structures.
- Cardiovascular:** Pertaining to the heart and blood vessels. The circulatory system of the heart and blood vessels is the cardiovascular system.
- Endovascular:** Internal; inside or originating from within the body or an organ. Pertains to the blood vessels.

There are several catheter bonding applications that EXFO can assist you with such as:

- Balloon bonding
- Marker bonding
- Guide wire assembly
- Catheter coating
- Hub bonding
- Lumen sealing
- Tube joining
- Sensor attachment

This application note will show you how using an EXFO OmniCure® Series 2000, a R2000 Radiometer, a High Power Fiber Light Guide or EXFO Cure Ring will bond balloon catheters.

Description of adhesives used

Adhesives used in balloon catheter assembly applications are required to withstand severe conditions related to temperature, moisture and pressure. The balloon bonding application is specifically effected by these conditions. Light cure cyanoacrylate formulations are well suited to balloon catheter applications because they offer excellent adhesion to a wide variety of substrate materials, minimize stress cracking and blooming. They are also well suited to bond dissimilar substrate materials including polyolefins, thermoplastics, rubber and metal.

Methods for Curing

Balloon bonding of a catheter requires 360-degree illumination to properly irradiate the assembly. Curing both ends of the balloon catheter interface simultaneously is highly advantageous. Custom designed light delivery accessories like the EXFO Cure Ring, can be coupled to standard light guides to achieve this result. Alternatively a balloon catheter can be cured using a multi-legged High Power Fiber Light Guide consisting of 3-4 legs, which will cure different points around the catheter.

Typical Curing Parameters

Exposure Time: The time in seconds the shutter is open at the specified intensity set point.

Irradiance Set Point: The optical output power level. The irradiance set point should be set using the R2000 Radiometer. When in absolute mode on the OmniCure® 2000, irradiance level in W/cm^2 will be shown on the OmniCure® 2000 display. When in relative mode, iris level will be shown in %.



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Using an EXFO Cure Ring to Bond a Balloon Catheter:

EXFO suggests using a UV curable cyanoacrylate adhesive, along with an OmniCure® Series 2000, R2000 Radiometer, and a standard light guide coupled with an EXFO Cure Ring.

For Balloon Bonding Catheters, EXFO suggest the following:

Exposure Time: 5-25 Seconds
Irradiance Set Point: 4-6 W/cm²

Note: These parameters are typical but not limited to, and may vary depending on your application adhesive and curing conditions.

Using a Multi-legged High Power Fiber Light Guide to Bond a Balloon Catheter

Space may be limited or the size of the balloon catheter might make using a Cure Ring not suitable for this application. Also, there are transmission losses when using an optical accessory. Using a 3-4 multi-legged light guide will enable curing in tight space constraints, cure larger balloon catheters and require less energy than an optical accessory. High Power Fiber Light Guides will lower the amount of power you use, which results in increased lamp life. EXFO suggests the following:

Exposure Time: 5-20 Seconds
Irradiance Set Point: 1.5-2.5 W/cm²

Note: These parameters are typical but not limited to, and may vary depending on your application, adhesive and/or curing conditions.

To minimize process variations, the OmniCure® Series 2000 contains Closed-Loop Feedback Technology that continuously monitors the light at the source and automatically makes adjustments to maintain the user selected set point. This ensures the required output level is maintained for every cure. The EXFO R2000 Radiometer can be used to calibrate and set the output on all of your OmniCure® 2000 systems wirelessly, to ensure an exact process; crucial in the manufacturing of medical devices. The R2000 calibration is traceable to NIST.

High Power Fiber Light Guide

EXFO High Power Fiber Light Guides will lower the cost of operation by providing 50% more throughput than standard fiber light guides. This provides more energy from your lamp, which leads to increased lamp life in your curing system. High Power Fiber Light Guide have equal energy between each leg which is essential for curing along the bondline.

EXFO's OmiCure® Series 2000 is ideally suited for today's growing medical device market; it is simple to use, highly efficient and above all maintains control and repeatability, making EXFO's Spot Curing Systems the most intelligent worldwide.



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OmniCure® Series



R2000 Radiometer



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