

OmniCure[®]

UV Bonding • In Control

OmniCure[®] Assembly Solutions

Biosensors

Challenge

Repeatable, low cost, assembly of biosensors.

Solution

The OmniCure[®] S2000 UV spot curing system with Closed-Loop Feedback technology with a light curable acrylate adhesive.

Benefit

A repeatable curing process which will maximize product yields and reduce manufacturing costs.



A biosensor is an analytical device which converts a biological response into an electrical signal. They are becoming the choice for a cost-effective diagnostic tool with the capability to render efficient, easy-to-use, yet accurate diagnosis.

While technological advances in biosensors are allowing this technology to cater to an extensive range of applications in a number of fields, such as industrial and environmental testing, the largest applications have been in the healthcare sector including:

- Glucose Detection
- Pregnancy Testing
- Blood Testing
- Breath Analyzers
- Cancer Diagnosis



Glucose detection is the most widely used application of a biosensor, driven by the increasing incidence of Type II diabetes in both developed and emerging markets. Approximately 26 million people in the U.S. have diabetes, and if the trend continues, more than 37 million people will be living with the disease by the end of 2015.¹

The major barrier to the growth of the biosensors market is the high cost of the devices. This barrier can be removed with the advent of better technologies and more efficient manufacturing techniques. This application note will show how using the OmniCure® S2000 UV spot curing system with proprietary Closed-Loop Feedback technology will help biosensor manufacturers achieve a fast, low-heat and repeatable assembly process to maximize yields and minimize assembly costs.

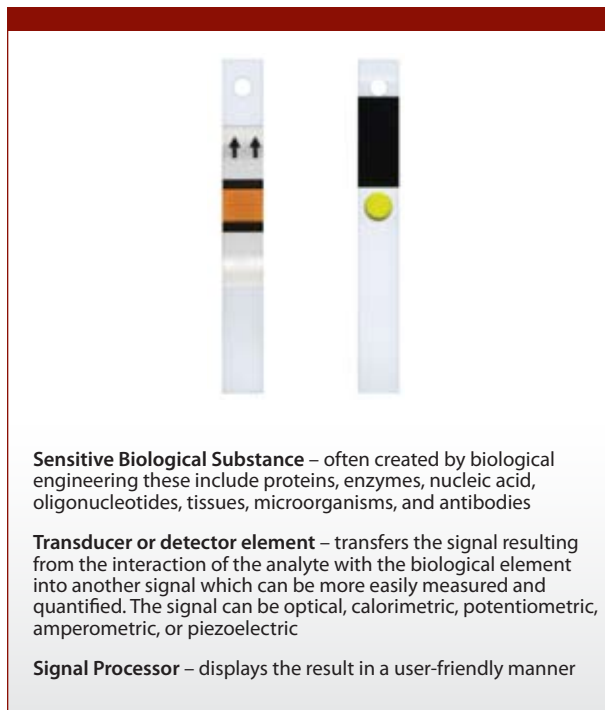
The Market

The worldwide market for medical biosensors is forecast to reach \$16 billion by 2012, up from \$12.3 billion in 2008; thus, growing at a CAGR of about 7 percent.² The demand for biosensors is due in large part to Point of Care (POC) testing; defined as diagnostic testing at or near the site of patient care. The driving notion behind POC is to bring the test conveniently and immediately to the patient; increasing the likelihood that the patient will receive the results in a timely manner. The POC market grew by 11% in 2008 and was valued at US\$12.6 billion.³ The impressive growth of the POC diagnostic testing market is principally due to the increased adoption of self-testing by the public. The global self monitoring blood glucose market is forecast to grow from \$9.6B in 2008 to \$19.7B in 2015 with an annual growth rate of 10.8%.⁴

1. American Diabetes Association, www.diabetes.org
2. Medical Biosensors Market, Technavio Insights, April 2009
3. Point of Care Diagnostics, Espicom Business Intelligence, Nov. 2009
4. Article "Global Self-Monitoring Glucose Market", www.pressabout.com, Oct., 2009, Source GlobalData

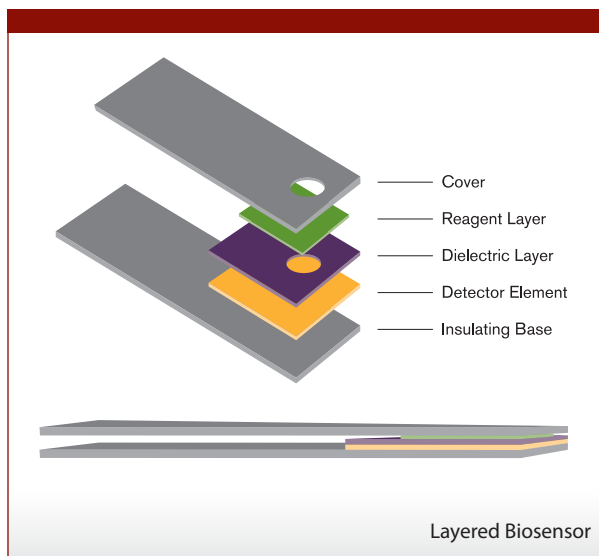
The Application

A typical biosensor consists of the following main components:



Manufacturing of a biosensor typically includes assembly of the components in multiple layers. The detector element is placed on an insulating base, followed by a precisely designed dielectric or insulating layer and finally a reagent layer. The function of the reagent layer is to convert glucose, or another analyte, into a chemical species which is measurable by the detector element. The function of the dielectric pattern is to insulate the detector element from the test sample except in a specifically defined area in order to enhance the reproducibility of the sensor reading.

A precisely defined area is important because the measurement of the sensor is dependent on both the concentration of the analyte and the area of the detector element which is exposed to the test sample. Therefore, it is very important that this defined area is consistent and repeatable in the manufacturing process in order to achieve consistent and repeatable readings between biosensors. A dielectric layer can be reproducibly fabricated using specialized UV curable acrylates.



UV curable acrylates are well suited for this application as the cured adhesive is chemically inert and provides suitable insulative properties for the dielectric pattern. Rapid, cure-on-demand nature of UV curable acrylates is ideal for manufacturability as the patterns can be cured immediately after they have been dispensed on the detector element to ensure that the precise pattern is maintained.

The OmniCure® S2000 UV spot curing system uses a 200W lamp to rapidly cure the acrylate adhesive in a low heat process. The lamp includes a proprietary dichroic coating on the reflector to reduce the Infrared (IR) energy reaching the substrate, minimizing the amount of heat on the sensitive detector element. The OmniCure® S2000 also includes a band pass filter to only allow specific wavelengths of light through to the parts; virtually eliminating all unwanted IR for even further heat reduction.

When curing a UV acrylate it is important to maintain a very repeatable irradiance level. While acrylates provide the benefit of curing very rapidly with UV exposure, it is also possible to cure them too quickly. This could have detrimental effects such as causing shrinkage in the material during the curing process. This could potentially change the size or shape of the dielectric pattern, therefore changing the reading of the sensor.

The OmniCure® S2000 UV spot curing system prevents these problems by allowing for very precise selection of irradiance levels in 1% increments. Once the optimum

irradiance level has been determined, the OmniCure® S2000 includes Closed-Loop Feedback technology to monitor and maintain the irradiance level of the UV curing process. This proprietary technology ensures a repeatable manufacturing process resulting in a high product yield of repeatable biosensors.

Manufacturing of biosensors poses challenges to repeatedly assemble sensitive components in a low heat, low cost process. UV acrylates must be cured in a controlled and repeatable process in order to create a specific size and shape of dielectric pattern. Lumen Dynamics' OmniCure® technology offers unique benefits over and above standard UV curing, ensuring low heat, repeatable curing for cost effective assembly of specialized medical electronic components such as biosensors.

OMNICURE® UV CURING TECHNOLOGY – PRECISE AND REPEATABLE

- The OmniCure® S2000 UV system cures UV acrylics in seconds and can easily be integrated into fully automated production processes.
- The Closed-Loop Feedback technology found in the OmniCure® S2000 system ensures repeatable irradiance levels. The OmniCure® S2000 lamp includes a dichroic filter to virtually eliminate IR light for a low heat curing process.
- The OmniCure® S2000 has a choice of 5 different filter options to provide further low heat curing for sensitive components.



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