

# OmniCure<sup>®</sup>



## A PPLICATION NOTE APEL-01 Bonding of the Lens Module for Camera Phones

# Bonding of the Lens Module for Camera Phones

There are currently 1.7 billion cell phone users worldwide; expected to grow to over 3 billion by 2009. Strong subscriber growth combined with strong replacement sales for newer feature rich models saw sales increase by 30% to 663 million units in 2004.<sup>1</sup>

Within the mobile phone there are a number of potential applications for UV spot curing including:

- i) Speakers
- ii) LCD display
- iii) Camera module

One of the driving forces for increased sales of replacement phones is the availability of camera phones. It is estimated that 35% of mobile phones sold in 2004 incorporated an internal camera. Camera phones are currently outselling digital still cameras by almost 4:1.<sup>1</sup>

This application note will describe the benefits which the OmniCure® 2000 and R2000 Radiometer bring to the manufacturing of the lens module for camera phones. It will describe potting the lens module into a plastic housing using a UV curable adhesive and an OmniCure® 2000 spot curing system.

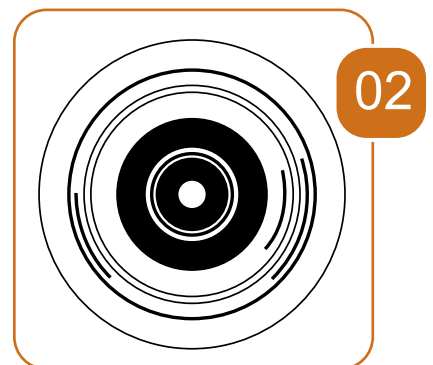
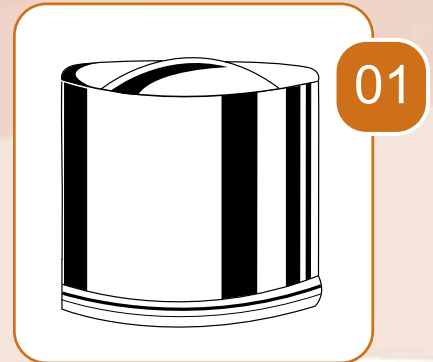
## Process Concerns

- 1 Speed: this is a high volume process; therefore the adhesive must be fully cured as quickly as possible.
- 2 Repeatability: It is essential that the process be very repeatable to ensure the highest yield of parts. If the process changes and parts start to fail, thousands of parts could be scrapped before the error is noticed.
- 3 Reproducibility: There will be a number of production lines running the same parts. It is essential for each line to be running at the same process levels.
- 4 Heat: The application includes bonding to a dark plastic part. Colored plastics will absorb visible light and convert the light energy into heat. Plastic parts must be kept at relatively low temperatures or else they can deform during the curing process. The need for a fast cure will likely push a customer to try using higher irradiance levels to shorten the cure time; higher irradiance can lead to faster heating.
- 5 Shadowing: The lens must be secured in place on two sides opposite each other. The lens module is opaque so the process requires curing from multiple points.
- 6 Automation: The curing system will be integrated as part of an automated process so it must be straight forward to control the system remotely.

## Equipment for Curing

EXFO recommends using the OmniCure® 2000 system with a 320-390nm filter installed. The 320-390nm filter will eliminate the visible light which will be absorbed by the dark plastic parts; generating heat. The EXFO R2000 Radiometer should be used to calibrate the OmniCure® 2000 and set the irradiance level for the process. A 2x3mmx1000mm High Power Fiber Light Guide can be used to evenly cure the parts from two sides simultaneously.

<sup>1</sup> Weaver, Graham "The Mobile Phone Industry, A Strategic Overview" © Reed Electronics Research, UK 2005



**EXFO suggests the following curing parameters:**

Exposure Time: 2 to 5 Seconds  
 Irradiance Set Point: 3 to 5W/cm<sup>2</sup>  
 Distance: 8 to 12mm

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

This process requires a precise irradiance level in order to cure the parts as quickly as possible without overheating. In this case about 3W/cm<sup>2</sup> was found to work very well; which is only about 10% of the output of the OmniCure<sup>®</sup> 2000. Curing systems that do not allow you to select an irradiance level down to 10% of the total output would require the distance between the light guide and the surface to be increased to minimize the temperature felt by the substrate (parts). This distance would then need to be decreased as the lamp output decreases. The spot size will change as the distance is changed, making it much more difficult to control the process.

To eliminate variations in the irradiance output, the OmniCure<sup>®</sup> 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 the OmniCure<sup>®</sup> 2000 systems wirelessly, to ensure a reproducible process. The R2000 calibration is traceable to NIST. Features and benefits of using EXFO systems for this application are:

**Potential Adhesives for this Application**

04

- Bondmaster Lite Lok 496
- EMI EMCAST 1748
- Parsons Parlite 4019
- Rite Lok UV301



OmniCure<sup>®</sup> Series 2000



R2000 Radiometer

**Features**

**Benefits**

The OmniCure<sup>®</sup> 2000 systems includes iris adjustment to set precise irradiance levels on the UV system

The optimum irradiance level can be set to cure the parts as quickly as possible without overheating

Closed-Loop Feedback ensures the UV curing system maintains a constant irradiance level

A repeatable manufacturing process with very high yields

Bandpass filters: 320-390nm filters installed in the OmniCure<sup>®</sup> 2000 minimize the heat from visible light being absorbed by the dark plastic

More UV energy can be transmitted to the sample without overheating the parts; resulting in shorter curing time and more parts being made

R2000 Radiometer can be used to calibrate and set the OmniCure<sup>®</sup> 2000

All UV curing systems can be easily set to the same irradiance level resulting in a reproducible process across production lines

2x3mmx1000mm High Power Fiber Light Guide provides equal irradiance to each leg

Ensures equal curing on both sides of the lens to improve yields

The OmniCure<sup>®</sup> 2000 system includes two I/O ports and RS-232 communication for controlling the system remotely

The curing system can be easily integrated into an automated system minimizing development time

**Results:**

EXFO's OmniCure<sup>®</sup> 2000 system is ideally suited for today's growing mobile phone industry; 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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