Challenge

Assembly of durable compact camera modules for cell phones with short manufacturing cycle times while achieving maximum yields.

Solution

The OmniCure® LX400+ LED Spot Curing system with 365nm heads and 8mm lenses.

Benefit

A repeatable curing process which will maximize component yields and reduce manufacturing costs.
UV spot curing is an integral part of increasing manufacturing capabilities to meet the growing demand for cell phones. Within the mobile phone assembly process, there are a number of applications where UV spot curing is used including:

1. Speakers
2. LCD display
3. Compact camera module
4. Touch screen

This application note provides a brief overview of the assembly process for compact camera modules used in cell phone handsets, and highlights the important role of UV curing. Camera module manufacturers can benefit from using the OmniCure® LX400+ LED spot curing system to make the assembly of cell phone cameras a cost-effective, repeatable process.

**Market**

In the field of consumer electronic devices, such as cellular phones, there is constant pressure to make the devices more compact, less expensive, and more feature-rich. In turn, manufacturers of such devices place the same pressures on each of its component suppliers.

In 2010, total shipments of cell phones reached over 1.4 billion units globally, up about 20% from 2009. New features added to cell phone handsets such as touch screens and multimedia players are helping to ensure continued growth while features such as integrated cameras are now standard items on most cell phones. In 2009, it was estimated that 67% of cell phones included an integrated camera module with a forecast to grow to over 75% of phones by 2012. Cell phone manufacturers are looking for camera modules to be compact, inexpensive, and to have increased capabilities which may include higher resolution image sensors and higher quality optics.

**Application**

Typically, camera modules are manufactured by attaching the image sensor of the camera module to a circuit board and then attaching a housing containing the lens to the same circuit board, over top of the image sensor. UV curable adhesives are widely used in the assembly of compact camera modules to provide a short manufacturing cycle. In this automated production process, the individual elements are bonded in 2 to 3 seconds. The adhesives must rapidly join heat sensitive materials, such as plastic, providing a very strong bond able to withstand harsh conditions of cell phones such as shock and moisture.

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1. Gartner Announces Global Smartphone Sales Q3, 2010, Source Gartner
2. The Worldwide Mobile Phone Camera Module Market, 2008 and Beyond, June 2008, Source MIC
The OmniCure® LX400+ LED spot curing system with 365nm heads and 8mm lenses has proven to be an effective solution in the manufacturing of compact camera modules by providing fast and repeatable curing of UV adhesives. The OmniCure® LX400+ includes four foot pedal connections along with I/O connections for easy integration into automated manufacturing processes.

The lens housing must be secured to the circuit board in multiple sites requiring a system which can control multiple curing heads. The LX400+ system can control up to four UV LED heads to accommodate this application. The UV LED heads can be controlled simultaneously or independently depending upon the required configuration. If the process requires only two heads for assembly, cable extensions are available to allow for one controller to be used for two different assembly stations making for a more cost-effective solution. Selectable foot pedal modes, unique to the OmniCure® LX400+, make it simple for a single system to be used at multiple cure stations.

Utilizing the latest in LED technology, the LX400+ is designed to minimize the running costs for the assembly of camera modules. With patented Intelli-Lamp® technology applied to the LED head design, LED temperature and lamp life are monitored allowing for an optimized life guarantee of 10,000 hours of operation or three years.

The assembly of compact camera modules includes the attachment of a dark plastic lens housing to a circuit board. The need for rapid assembly will push manufacturers to use the maximum possible irradiance to minimize cure time. However, this must be balanced with the need to maintain low temperatures during the curing process. Colored plastics will absorb visible light which will heat the plastic. If the housing becomes too hot during the process, it can become distorted which could cause misalignment between the lens and the image sensor.

The OmniCure® LX400+ LED system is ideal for this application since it is able to provide a very narrow band of 365nm UV energy for curing the adhesive. The 365nm energy is a very good match to the most common photoinitiators used in the UV adhesives without any visible light. Therefore, a high irradiance level can be used for rapid curing with minimal heating during the curing process.
OMNICURE® UV CURING TECHNOLOGY – PRECISE AND REPEATABLE

- The OmniCure® LX400+ LED UV curing system with 365nm heads will cure UV adhesives in seconds and can easily be integrated into fully automated production processes
- The OmniCure® LX400+ system will control up to four heads simultaneously or independently to cure multiple sites on the same part or can be used at multiple curing stations
- LED heads for the OmniCure® LX400+ system include patented Intelli-Lamp® technology allowing for an optimized life guarantee of 10,000 hours or three years, reducing running costs of the process
- The OmniCure® LX400+ system with 365nm heads and 8mm lenses provides high irradiance and low heat curing for sensitive components

Summary

Manufacturing of compact camera modules for cell phones poses challenges in achieving strong bonding of heat sensitive materials in a rapid, automated process. Designed using advanced technology, OmniCure® solutions offer unique benefits over and above standard UV curing systems, ensuring repeatable irradiance levels and low heat curing for cost-effective assembly of specialized electronic components such as compact camera modules.