Advanced Camera Modules Require Dual Function Adhesives

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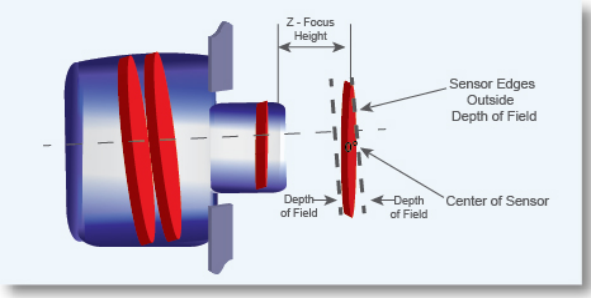
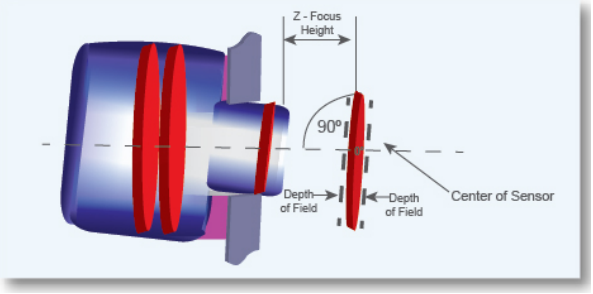
The market for camera modules continues to expand as more products incorporate image sensing technology and improve on current image sensing capability. Camera modules are integrated into multiple applications such as handheld devices, automobiles, medical systems and gaming products, among others. With projections of a CAGR at nearly 10% over the next few years, the camera module market will remain healthy to say the least.

Not only are more and more products integrating camera modules, but the functionality also continues to advance. In fact, some mobile device manufacturers are already pushing for 20 mega pixel capability – a requirement that will dictate more lenses within the camera module assembly and the need for highly capable adhesive materials to facilitate their manufacture. With the increasing number of lenses, ensuring a correct optical path with all of the lenses aligned to the image sensor is critical for robust function. This alignment step for camera module lenses is referred to as "Active Alignment" and in order to achieve the best possible lens alignment that maintains position through all of the subsequent processing steps, advanced dual cure adhesives are essential. Adhesives with dual cure capability allow for an initial light cure to help hold the camera module assembly in place following active alignment. The assembly can then be transported to curing ovens for a final, thermal cure without risk of lens movement and misalignment.

Off-Centered Optical Path



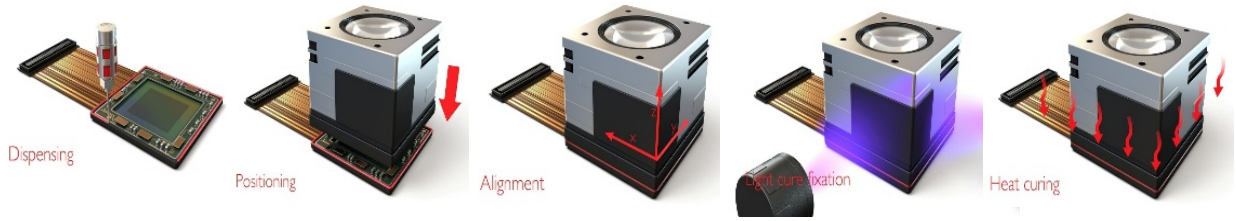
Corrected Optical Path



Misalignment (left) can negatively impact camera module function. Active alignment is required to produce a correct optical path from the image sensor to the lenses (right).

As seen in the diagram below, there are five main steps in the camera module assembly process. First, the dual cure adhesive is dispensed around the edges of the substrate which houses the image sensor. The lens holder is then positioned on the substrate and secured to the dual cure adhesive. Next, the camera module is activated and the lenses are aligned to the image sensor. Once the alignment is set, UV or LED light is used to partially cure the adhesive to hold the alignment in place. This cure is strong enough to hold the alignment so that the

camera module assembly can be transported to a thermal cure oven where final, permanent curing takes place. Dual cure adhesives are a major advance for camera module assembly, as the partial cure prevents movement of the lenses during transport, which often resulted on an off-center optical path.



Assembly of high-pixel, multi-lens camera modules requires dual cure adhesives for high reliability.

With a full portfolio of dual cure adhesives and next-generation formulations in development, Henkel leads the market with camera module assembly solutions. The latest material, LOCTITE® ABLESTIK NCA 2280LV, is a dual cure adhesive that has an extended electromagnetic spectrum to enable fast light curing with UV or LED. With a broad spectrum that extends up to 405 nm, LOCTITE ABLESTIK NCA 2280LV offers camera module manufacturers flexibility in terms of lamp type and intensity. The material is one-part, which simplifies processing and storage, and is also black in color to prevent perimeter light seepage for proper function of the image sensor and module.

In addition to these performance advantages, LOCTITE ABLESTIK NCA 2280LV also offers the market's fastest cure time at low temperature (30 minutes @ 80°C) during the final thermal cure phase and has very low moisture absorption and low cure shrinkage. Both moisture absorption capabilities and cure shrinkage rates are very important for camera module assembly. If an adhesive absorbs too much moisture, the material will swell, causing the alignment to shift. The same holds true for cure shrinkage. Following active alignment, if the light cure initiates material shrinkage, the alignment is shifted and the lens holder can move which may result in a non-functional camera module. Exceptionally low weight loss is also an important characteristic for dual cure adhesives. During the thermal cure, if there are significant volatiles released from the material, the lenses may become contaminated or fogged and produce a damaged image. Here, LOCTITE ABLESTIK NCA 2280LV also offers good performance with low weight loss of less than 0.5% at 260°C.

While LOCTITE ABLESTIK NCA 2280LV is the latest in Henkel's dual cure adhesive portfolio, it is just one example of the formulation innovation taking place for this material class. Several new products designed to address future camera module requirements are already in development.

For more information on Henkel's complete portfolio of dual cure adhesives, visit www.henkel.com/electronics or listen to a recording of our recent webinar on the topic.

Additional details on Henkel's full portfolio of camera module material solutions can be accessed here.