LED lighting technology has become pervasive. This once specialized illumination technology now touches infinite applications – from consumer to automotive to industrial to architectural and beyond. However, the drive toward more efficient and long-lasting lighting as compared to traditional incandescent solutions has come with some very high expectations. Consumers are willing to absorb a slightly higher purchase cost, but demand that performance, energy efficiency and longevity are commensurate with the price. In other words, high reliability, optimal lumen output and long product life are critical.

All the various materials used for LED assembly – from the substrate (printed circuit board) to the thermal interface material to the die attach, component interconnect material and overmolding— enable the performance and lifetime demands of LED products. Proper material selection for each of these areas is key and can be the difference-maker for satisfied customers and positive brand association. And, while material capability is tantamount, partnering with a supplier that offers a comprehensive solution and has in-depth, holistic knowledge of LED assembly and materials compatibility is also very important.

With the expansion of its thermal management materials portfolio following the acquisition of Bergquist, Henkel cemented its position as the leading supplier of materials for all levels of LED assembly. Award-winning insulated metal substrates and thermal interface materials, high-performance die attach systems, game-changing solder materials and a full portfolio of PCB protection and encapsulation solutions make Henkel the partner of choice for lighting specialists around the globe.

**Henkel LED Lighting Materials Solutions**
The Henkel LED materials portfolio, which is technology-rich and has enabled some of the most successful and innovative lighting products on the market today, includes, but is not limited to:

**Thermal Control**

*Thermal Clad® Thermal Substrates*
Key enablers of LED reliability are Henkel’s renowned Thermal Clad® Insulated Metal Substrates. More effective at heat dissipation than standard FR4 printed circuit boards, *Thermal Clad* substrates are constructed of a metal base and coated with a dielectric layer on which the circuit layer is applied.

*StabiLux Reflective Coatings*
Maintaining performance and extending the brightness lifetime of LEDs offers differentiation in the competitive lighting sector. Henkel’s StabiLUX reflective coating, designed for use with FR4 printed circuit boards and *Thermal Clad* insulated metal substrates, maintains nearly all of its reflectance after reflow soldering or prolonged UV exposure and delivers a longer brightness lifetime as compared to solder mask alone.

*Gap Pad® and Gap Filler Thermal Interface Materials*
Gap Pad® and Gap Filler thermal interface materials (TIMs) both enable transfer of heat from the substrate into the heat sink. *Gap Pads* provide conformable, easily applied thermal interfaces that deliver the ability to accommodate for uneven surface topography and airgaps, allowing for effective heat removal in a low-stress solution. For more complex architectures where pad-based materials are not the best option, Henkel’s liquid *Gap Fillers* offer an alternative. Self-leveling formulations and materials that have low outgassing to prevent lens fogging are optimal *Gap Fillers* for certain lighting applications.

**Die Attach Materials**

For bonding LED dies, Henkel offers a range of Loctite® Ablestik® die attach adhesive materials in both paste and film formats with properties tailored for various LED chip configurations, sizes and power ratings.

**Solder Paste Systems**

LED board assembly is also facilitated by high-performance solder pastes. Henkel has a complete line of traditional, lead-free, halogen- and halide-free and water soluble high performance solder pastes. Most notably, Henkel’s award-winning Loctite® GC 10 temperature stable, lead-free solder paste material delivers unique logistics, storage and processing advantages. Temperature stability at 26.5° C for one year and at 40°C for one month means manufactures can do away with expensive shipping requirements and on-site refrigerated storage. In process, Loctite GC 10 provides for more consistent print transfer efficiency, greater online paste utilization and, for reflow, an expanded window with soak temperatures between 150°C and 200°C.
Circuit Board Protection and Encapsulation

Conformal Coatings
As many LED lighting applications are designed for use in exterior environments, ensuring protection from the effects of UV light, moisture, salt spray and temperature changes is imperative for their long-term operation and reliability. Henkel’s line of conformal coating materials safeguards LED driver boards and component leadframes from harmful environmental conditions and protects them from contaminants that can inhibit function.

Technomelt® Overmold Materials
Some delicate LED components can become damaged during conventional potting processes, which is why lighting specialists are increasingly turning to Henkel’s low pressure Technomelt® hot melt adhesives for certain applications. UV stability is built into both the reflective white and optically clear Technomelt formulations, which are ideal for the lighting sector. The clear version allows for high transmittance of optical signals for lighting sensors, while the reflective white Technomelt offers aesthetic alignment with indoor and outdoor architectural lighting. In addition, a new thermally conductive material, Technomelt TC 50, facilitates heat dissipation through the encapsulating layer and is an effective solution for LED driver boards and transformers.

Potting Materials
Available in epoxy, urethane and silicone formulations, Henkel has developed a suite of potting solutions for multiple lighting components and end use requirements. From chemical resistance to flame retardance to ultra-clear materials, Henkel potting solutions help LED structures maintain reliability, durability and color clarity.

Living up to consumer expectations for LED lighting products can be challenging, which is why choosing the right partner is critical. A supplier that has a universal understanding of the requirements for LED processes and structures will help deliver LED systems that are reliable, long-lasting and offer consistent illumination. To learn more about Henkel’s complete LED materials portfolio, visit www.henkel-adhesives.com/electronics. Consult with one of Henkel’s LED technical specialists by sending an e-mail to nico.bruijnis@henkel.com or calling +1-714-368-8000.