Customizable Silicone Materials for Advanced MEMS Performance

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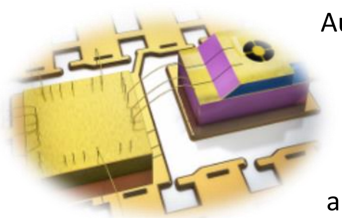
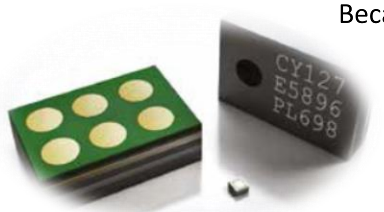
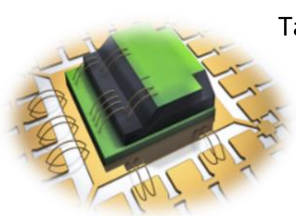
The application of microelectromechanical systems (MEMS) in today's electronics products – from handheld to medical to automotive devices – is enabling unprecedented functionality. In smartphones, the ability to scroll faster, talk on microphones with noise canceling capability and leverage location navigation via position sensors is all based on MEMS technology – and this barely scratches the surface of the wealth of applications associated with MEMS. Overall, consumer mobile applications are driving more than 50% of the total volume for MEMS. In fact, MEMS microphones alone are forecast to grow at a compound annual growth rate (CAGR) of greater than 11% between 2015 and 2019, according to research firm IHS Inc.



Automotive integration of MEMS is also in the fast lane. Pressure sensors, speed sensors, air flow sensors, magnetometers, and accelerometers – all are based on MEMS and are critical elements to proper automobile function and efficiency. And, while handhelds, automotive and even medical devices are similar in their requirement for MEMS and sensor capability, the application and design considerations are vastly different. For handheld devices, space is at a premium and dictates exceptionally small dimensions with MEMS devices that contain thin, fragile features. With automotive MEMS devices and other sensor technologies, sensitivity level and high temperature compatibility are key considerations.



Because of the variations in device function and manufacturing considerations, selecting the proper materials is critical for end use reliability and performance. With handheld MEMS devices, the ability to control die stress is essential. If too much force is applied during die bonding, the die can crack. When the bonding adhesive's modulus is high, the die may bend due to stress and this deformation can cause the moving components of the MEMS device to go out of calibration, compromising its performance. In the case of automotive sensors, the response sensitivity of the sensor is key to control of its function. When material properties change over time and experience shrinkage, for example, the calibration can be altered and the device output may be sub-standard. If the package planarity is slightly off, performance of the MEMS device may suffer. For critical applications such as air bag deployment or braking systems, inferior calibration could be catastrophic. Temperature stability of the die attach material is also vital; both to withstand the heat generated by die function and the environmental temperatures to which the device may ultimately be subjected.



Tackling these demands, Henkel has developed a customizable silicone platform that allows for modification of key properties such as rheology, modulus and color, with a wide process window during material application such as dispensing and cure. The formulation innovation of the Loctite® Ablestik ABP SIL series of die attach materials takes into consideration the varying properties that are necessary for a particular application and allows for their modification to help ensure better performance and long-term reliability. The modulus range of Henkel's new silicone platform can be customized from 0.1 to 200 MPa delivering the ability to optimize stress control and response sensitivity across various die thicknesses and dimensions. In addition, the moduli and expansion coefficients of these products are stable and predictable across a wide temperature range. Henkel's Loctite Ablestik ABP SIL materials have exceptional thermal stability, maintaining a low and stable modulus from far below room temperature to temperatures as high as 300°C. The thixotropic properties -- or the material's ability to hold its shape -- can also be modified based on requirements. A thixotropic index range of 1 to 10 has been successfully achieved with this new silicone system and, for applications that require specific colors to accommodate light transmittance requirements, Loctite Ablestik ABP SIL materials can be custom-formulated in a range of colors.

As compared to conventional epoxy-based materials, Henkel's new silicone platform provides numerous advantages, delivering customizable properties to ensure robust function and better long-term reliability. As the use of MEMS applications proliferates both within specific end products and across market sectors, the need for modifiable materials platforms to address unique performance requirements will be immense. Henkel is leading the market in this formulation approach with its new Loctite ABP SIL series of materials for advanced MEMS and sensor production.

For more information, visit www.henkel-adheisves.com/electronics or call +1-888-943-6535 in the Americas, +32 1457 5611 in Europe or +86 21 3898 4800 in Asia.