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Nippon Electric Glass Co., Ltd.

Development of Glass Frit for Laser-Sealing of Ceramic Package

Nippon Electric Glass Co., Ltd. (Head Office: Otsu, Shiga Prefecture, President: Motoharu Matsumoto) has developed and begun shipping samples of the world's first glass frit for laser-sealing with a lower coefficient of thermal expansion (CTE) than conventional products and improved ceramic wettability*1.

(*1 Wettability: property of spreading and solidly adhering (reacting) uniformly to a solid surface)

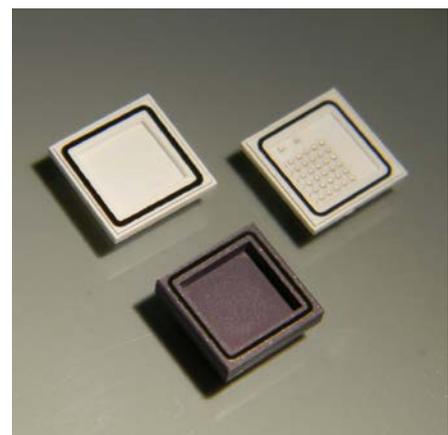
Semi-conductor ceramic packages in image sensors, LEDs and other products requiring good light transmission properties use a transparent glass lid and ceramic cavity. The seal between these components has traditionally been used a resin with low temperature sealing capability. However, sealing with a resin creates issues with strength, air tightness, and durability, so for applications where a high degree of reliability is required, extremely expensive gold-tin soldering is commonly used as sealing material. Conversely, although the biggest advantage in using a glass frit for laser-sealing is the ability to pinpoint the laser beam to a local sealing area and thereby avoid damage to the devices contained inside, traditionally the difference in thermal expansion between the glass frit and the ceramic material and poor wettability properties required higher laser power, which then resulted in such problems as thermal shock to the glass lid, making it vulnerable to cracking.

With this in mind, we have succeeded in developing a glass frit for laser-sealing optimized for the sealing of the glass lid with a ceramic cavity.

<Characteristics and Effectiveness of New Product>

- ① **Similar CTE to ceramic material (6.5 - 7.2 ppm/°C)**
(10% lower than a conventional part according to a study by NEG)
(Effectiveness)
While cooling after the sealing, there is less difference in the contraction amounts for each component and thus, less damage to the components.

- ② **Excellent wettability with ceramics**
(Effectiveness)
As laser power can be reduced by 10% (according to an NEG study comparing it with a traditional part), it is possible to achieve sealing at a low temperature, which restrains cracking in the glass lid due to thermal shock.



Applications of glass frit for laser-sealing

<Future Business Opportunities>

With the expected growth in deep ultraviolet(UV) LEDs used in sterilizing equipment and other applications, changing the package sealing material from resin to glass frit for laser-sealing will improve the deep UV LED reliability and contributes to longer product life. In addition, if used for ceramic packages installed on automobiles, which require long-term reliability in a harsh environment and if used in the organic EL sealing light emitting elements in two-layer glass

substrates, shorter cycle time and improved yield rates can be expected in the laser sealing operation.

<New Ideas from us>

In addition to this newly developed glass frit for laser-sealing , we can also offer a paste made of this glass frit uniformly dispersed with organic solvent, glass frit coated glass lids (with various types of CTE are available) and LTCC² cavities, to meet various needs for ceramic package products. (Please see the illustrations below, the items in blue letters are our products.)

² LTCC: Low Temperature Co-fired Ceramics

<Structural example for Deep UV LED Packages>

