



ENCAPSULATION BY LASER WELDING OF MULTILAYER PLASTIC FOILS

Task

Developments in the course of renewable energies as well as the trend towards mobile devices have led to ever more intricate, complex electronic components, which partially require the use of highly sensitive materials such as lithium or organic conductors and semiconductors. These materials often react very sensitively to water and oxygen. To prevent this interaction with the environment, high-barrier multilayer films have been developed. Thanks to special barrier layers, these films, often very thin, prevent water and oxygen from permeating, or reaching the sensitive components. The base substrate of the film is usually a polymer which provides the film with high flexibility. Conventionally, the protected components are bonded peripherally to the foil or welded so that a pocket results, which, for example, contains the flexible organic LED. This new joining technique, laser welding of multi-layer polymer films, promises higher throughput and format flexibility.

Method

Polymers have specific absorption bands in higher wavelength regions. The location and intensity of these absorption bands is dependent upon the polymer. A suitable laser beam source can be used to melt only one layer in a multilayer film consisting of various polymers. This makes it possible to locally melt the bottom layer in order to weld it to the opposite sheet during laser transmission welding, for example. No energy is deposited in the overlying layers.

Result

Welding tests and thin sections show spatially limited melting in the targeted layer and no melting in the overlying layers.

Applications

This technology can be used in a wide range of applications: from food packaging with lower requirements on the tightness to water and oxygen, via medical packaging with more stringent requirements, all the way to the encapsulation of organic LEDs and solid-state lithium batteries described above.

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3 Encapsulated demonstrators.