



GLOBO WELDING OF TRANSPARENT POLYMERS

Task

Transparent polymer films and components can be joined together directly in an overlap arrangement without the material needing to be modified. Required for this, on the one hand, are an adapted laser-beam source that addresses the specific absorption bands of the respective polymer and, on the other, suitable laser-beam shaping. Furthermore, a joining force is absolutely necessary in order to fix the two joining partners to each other and, thus, to achieve the technical zero gap relevant to the process. To apply the joining force, pneumatically operated clamping devices are commonly used; they dispose of a flat glass-based contact pressure that can be transmitted by the laser radiation employed, in the wavelength range of 1.5 to 2 μm , with low losses. Alternatively, instead of glass, metal clamping devices can be used, which press the component arrangement in the outer area, but not in the area of the interaction zone between the laser radiation and the material. Current trends in many industries are moving towards format flexibility and individualization. The pressure systems described above can only meet these challenges to a limited extent or not at all.

1 *Globo welding optics during the welding process.*

2 *Welding seam after the process.*

Method

In order to satisfy current trends, various alternative clamping concepts have been examined. Emerging from these investigations is a clamping design patented by Leister Technologies AG, in which the laser beam is guided through a rollable glass ball, similar to a ballpoint pen. In this case, the optical ball component is used to guide the beam and apply it. As a result, a high degree of format flexibility is possible because the arrangement via, for example, a robot system can be moved to any position desired. This so-called globo principle was previously applied exclusively in the field of conventional laser plastic welding with absorber modification.

Results

In cooperation with the company Leister Technologies AG, Fraunhofer ILT has adapted and thus transferred the globo welding principle to absorber-free polymer welding. Moreover, the design has been implemented in a prototype optic.

Applications

In particular, this technology has great promise in packaging technology, medical technology but also in OLED, OPV and display encapsulation.

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