

Highlight

Serquigny,
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Advanced materials, additives and product design for high speed welding

The fact that polymeric materials show a good absorption of the laser radiation at longer wavelengths in the infra-red spectral range is well known already. However, commercially available laser sources emitting at these wavelengths were not available until recently.

One of the objectives of Polybright is to try and broaden the range of polymer material combinations that can be welded thanks to the development of this new high power brilliance lasers with wavelengths between 1500 and 1900 nm.

The list of materials that can be looked at throughout the project has been defined and includes a broad range of polymers (see Table 1), including 3 resins from ARKEMA based on renewable resources: Rilsan® (PA11), Pebax® Rnew 70R53 (PEBA) and Rilsan® HT CMNO (PPA).

Several campaigns of injection moulding were carried out in order to provide enough samples for carrying out preliminary characterisation. Resins were injected pure or with a 0.5 wt% carbon black loading, thus providing both transparent and absorbent joint partners for preliminary laser welding trials. Other injection campaigns were carried out to supply more basic samples. With these samples, Infra Red Spectroscopy analysis was carried out as well as measurement of the heat capacity and thermal conductivity. With the measurement of the density depending on temperature which is to come, enough data should be available for feeding the simulation program under development within the work package 4 - Flexible, robust and fast-adapting laser beam welding.

In parallel, static tensile tests were also carried out to later help separate the contribution related to the mechanical influence of the substrates from the mechanical contribution of the welded area.

Family	Materials
Polyolefin	PP, PE
Styrenic Copolymer	ABS, SAN
Polyamide	PA 6, PA 6.6, PA 11, PPA, PEBA
Other	POM, PC

Table 1 List of polymers to be tested

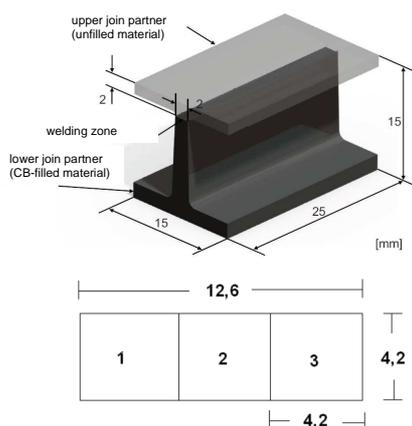


Figure 1 T-Shape and Step Plate sample for laser welding assessment



Applications

The development and use of new high brilliance laser sources in the higher near infra-red wavelength range for the welding of thermoplastics aim to enable the processing of these materials independently of their optical properties. Adapting the laser source to the material to be welded and not vice-versa as it is the case nowadays could revolutionize the development of new products by eliminating the restrictions concerning the colour of the materials to be joined and also provide product designers an additional degree of freedom. Furthermore new perspectives and approaches arise for joint configurations that were considered so far ineffective due to the actual limitations of the polymer welding process.

For any further questions our experts will be pleased to provide you assistance:

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