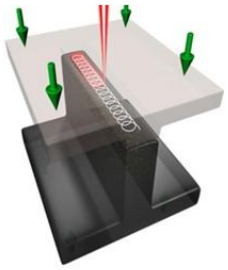
Highlight

Aachen,
November 28, 2012

Irradiation strategy for laser transmission welding of thermoplastics using high brilliance laser source

Investigated within PolyBright's WP4 is the correlation between crystallinity degree and spatial seam homogeneity for laser overlap welding of polymers applying the TWIST® method (Figure 1) which is based on a superposition of slow regular feed and fast circular or elliptical beam oscillation. Except for strong-scattering PA66, the heat affected zone (haz) shape is shown to be equivalent to the varying heating path, i.e. the area illuminated by the laser spot, as it is moved under TWIST® contour control, details see below in Figure 2 and Figure 3.

Figure 1: Fiber laser polymer welding using the TWIST® method. The focused laser spot is fastly superimposed along the regular welding contour



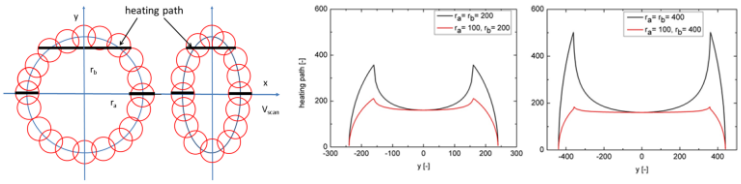


Figure 2, left: Sketch of the illuminated area corresponding to the periodic paths, left $r_a = r_b$ (circular motion), right $r_a = r_b/2$ (elliptic motion), red circles indicate the sequence of laser spots with diameter $_d$s, direction of weld seam is given by the scan velocity V_{scan}.
right: Calculation of the heating path as a function of the y-coordinate for small and large circular and elliptic motions, spot diameter: 80 µm, all units in µm.

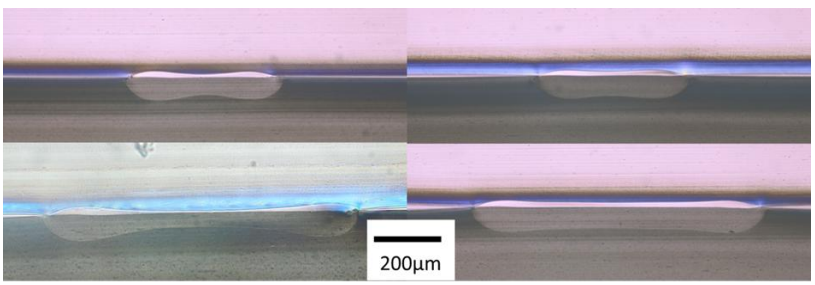


Figure 3: Micrographs of Pebax (a polyether-based thermoplastic elastomer from ARKEMA) showing the heat affected zone for different laser power and radii (P, r_a, r_b), from top left to bottom right: (2W, 200µm, 200µm), (2W, 100µm, 200µm), (4W, 400µm, 400µm) and (4W, 100µm, 400µm).

SEVENTH FRAMEWORK PROGRAMME

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