Capacity Area A3 Topic 1.2 Deliverable 2

Report on direct consolidation on hybrid yarns

Hybrid Bicomponent Fibers for Rapid Consolidation

The Laboratory of Composite Materials and Adaptive Structures at ETH Zurich has developed a novel class of hybrid preforms for the production of fiber-reinforced thermoplastic composites. The hybrid bicomponent fibers are continuous reinforcement fibers individually sheathed in a thermoplastic polymer. Due to the reduced flow lengths and the full wet-out of the fibers, this novel class of flexible thermoplastic composite preforms can be processed in short times, and thus have the potential to expedite high volume production of geometrically complex thermoplastic composite parts. During the course of this reporting cycle, a demonstrator part consisting of bicomponent fibers was successfully processed whilst achieving a high quality laminate through rapid stamp forming (Figure). This was accomplished through determination of minimum cycle time needed, for minimum void content. It was determined that thin laminates (ca. 1 mm) of bicomponent fibers can be successfully processed in very short times, namely 10 s, with void content of the resulting laminates being lower than 0.4 vol.% (Figure). The impressive laminate quality achieved in this very low cycle time benefits the adaptation of efficient lightweight material in high-volume markets i.e. the automotive sector.
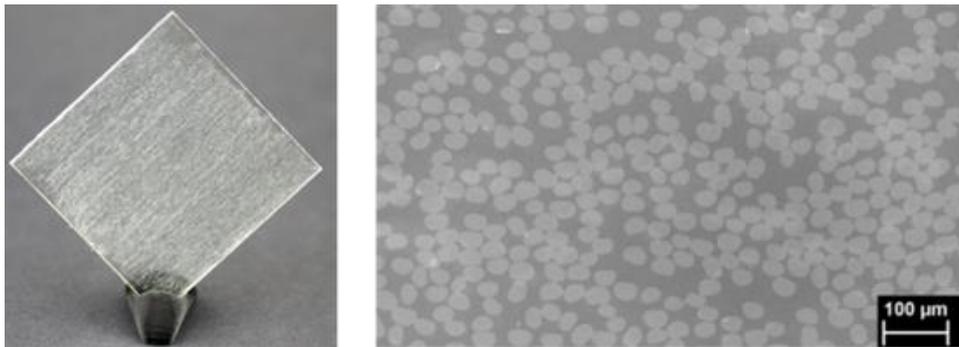
Rapid consolidation of hybrid bicomponent fibers as the first demonstrator parts consisting of minimal void content processed in 10s.