Deliverable Report

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1 Executive Summary

In the context of the D1.2 “Pilot run of flame retardant polymer materials including mechanical property testing” the main research focus was on the investigation of the mechanical properties and the classification of the ignition resistance of long-fiber-reinforced thermoplastic materials (LFTs). The required samples were manufactured using injection molding because this manufacturing technology was also chosen for the novel solar module rack-system due to component size and complexity. Since solar module rack-systems are constantly exposed to weather conditions and are therefore subject to aging, the material characterization was extended to include the aspect of material aging in oder to gain a better understanding of this influence.

The materials chosen were three different PP-based long glass fiber pellets, four different PP-based flame retardants, one PP-based color masterbatch and three ready-to-use short glass fiber compounds. The objective of determining the influence of the raw materials on the ignition resistance and the mechanical properties resulted in ten material combinations (trials) to be investigated.

Based on first calculations, the results showed that good mechanical properties could only be achieved by using long glass fiber pellets. The mechanical properties derived from the different characterization methods (tensile, flexural, and Charpy impact test) were reasonably comparable regardless of the long glass fiber pellets used. The results show no significant influence of the different materials on the mechanical properties. Analogously, there are only very small changes in the mechanical properties induced by thermal aging.

The results of the fire behavior investigation show that material thickness (sample thickness) is a decisive factor for the ignition resistance according to fire protection standard UL94. Sample thicknesses of 1.6 mm and 3 mm, corresponding to the assumed wall thickness of the finished component, were investigated. A classification according to UL94 could be achieved for one material combination with thin samples (1.6 mm) and for four material combinations with thick samples (3 mm).

In conclusion, in the context of this first material characterization a solid base was created for further investigations and first reliable findings with regard to the technical implementation using injection molding were obtained.

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