PROCESSING OF PAPER FIBER REINFORCED POLYPROPYLENE COMPOSITES

Martina Prambauer, Christoph Burgstaller

Transfercenter für Kunststofftechnik GmbH, Franz-Fritsch-Straße 11, 4600 Wels, Austria

Environmental concerns and legal regulations have led to an increasing interest in the search of sustainable reinforcement materials in polymer composites. In this connection, re-growing plant fibers are an interesting alternative to synthetic reinforcements (such as glass fibers), due to their high specific properties, low cost and density, as well as the low energy consumption during their production. The natural variation in fiber quality is considered as one of the main drawbacks of plant fibers, however fiber homogeneity can be significantly improved by applying processed pulps or papers. For the production of natural fiber reinforced composites there are different processing methods available. As a result, materials with varying characteristics regarding mechanical properties, fiber length and fiber-matrix adhesion are obtained [1]. In this work, three different processing methods for the production of polypropylene composites were examined. A conventional paper type was used as reinforcement, either in terms of whole paper sheets, or in shredded form. The composites were fabricated by the following production methods: (i) manual lay-up process of polymer films and paper sheets with subsequent thermal heating and consolidation steps, (ii) dip coating process, where the paper sheets were coated in hot polypropylene solutions and processed further by hot pressing, (iii) compounding and injection molding of shredded paper pieces and polypropylene granulate.

All samples were characterized by mechanical and thermal testing and the effects of the according processing method on the composite's final structure and properties were evaluated. The porosity content of the laminates was determined by TGA and density measurements and gave information about the fiber-matrix embedding. The fiber degradation and shortening due to processing was investigated microscopically and related to the mechanical properties of the according composite.

[1] Prambauer M, Paulik C, Burgstaller C (2016) Evaluation of the interfacial properties of polypropylene composite laminates, reinforced with paper sheets. Composites Part A 88: 59–66.