Investigation of Mechanical Properties of Unidirectional Steel Fiber/Polyester Composites: Experiments and Micromechanical Predictions - DTU Orbit (11/12/2018)

The article introduces steel fiber reinforced polymer composites, which is considered new for composite product developments. These composites consist of steel fibers or filaments of 0.21 mm diameter embedded in a polyester resin. The goal of this investigation is to characterize the mechanical performance of steel fiber reinforced polyester composites at room temperature. The mechanical properties of unidirectional steel fiber reinforced polyester composites (SFRP) are evaluated experimentally and compared with the predicted values by micro-mechanical models. These predictions help to understand the role of material and process parameters on material properties. Two types of SFRP were studied: polyester resin reinforced by both steel fabric containing unidirectional fibers and steel fibers wound on a metal frame with 0° orientations. The effects of the fiber volume fraction and the role of polymer yarns (weft) on mechanical properties were analyzed through tensile, compressive, and shear tests. These tests were performed as per the standard test procedures. In particular, issues related to processing difficulties, polymer yarns effect on properties, standardized testing, and properties under various loading conditions were addressed. Microscopic observations were analyzed to assess the laminate quality and the macroscopic fracture surfaces of shear test specimens were studied by standard techniques.

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