EFFECT OF THE THERMAL HISTORY ON THE FRACTURE BEHAVIOR OF PLA

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The aim of this study is to characterize and understand the fracture behavior of poly (lactic) acid (PLA) as a function of thermal history. The focus was on the effects of crystalline morphology on the fracture toughness values measured under impact as well as static loading conditions. The crack growth behavior of the PLA specimens was characterized with a standard test method for plane-strain fracture toughness using Single-edge-notched-bending specimens (SENB) under static loading. From the load-displacement curves, the critical stress factor K_C was calculated for all prepared PLA samples. Impact properties were measured using the Charpy test method. The crystalline morphology of PLA specimens was studied by polarized optical microscopy (POM), while scanning electron microscopy (SEM) was used for fracture surfaces characterization. The results show that fine spherulite morphology, as developed under annealing conditions, leads to improved impact resistance. This is probably explained by the formation of fibril structures visible on the fracture surfaces of impact specimens.