

EFFECT OF REPROCESSING ON BAMBOO FIBER REINFORCED POLYPROPYLENE COMPOSITE PROPERTIES

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Sustainable eco-efficient practices and products have gained increasing attention and the use of natural fibers as reinforcement for polymers has been rapidly expanding [1]. In certain composite applications biofibers have shown to be competitive in relation to glass fiber [2]. To assess recyclability of these composites bamboo fiber filled polypropylene composites were submitted to eight reprocessing cycles. Polypropylene composite specimens containing 40wt % bamboo fibers and 4wt% compatibilizer (maleic anhydride grafted polypropylene) were manufactured by extruding a blend of the composite components in a co-rotating twin-screw extruder, with subsequent pelletizing and injection molding. Composite specimens were then ground in a cutting mill and re-injected. For control neat PP was also submitted to the same processing and reprocessing conditions. Heat deflection temperature (HDT), tensile, bending, impact and fatigue ($F_{\max}=1400\text{N}$, $f=6\text{Hz}$) testing were performed. After eight reprocessing cycles HDT showed a drop of around 3%, tensile modulus 8%, flexural strength and modulus 10%, tensile strength 13%, Charpy impact strength and strain at break 30%, and fatigue life under cyclic tension-compression loading about 90%. SEM analyses revealed fiber breakage with reprocessing, however no significant differences have been observed between virgin and reprocessed composites regarding fiber-matrix adhesion. For most properties the drop was more pronounced after the first reprocessing cycle, likely because of more intense fiber breakage in this cycle with fiber size stabilizing afterwards. It has thus been shown that natural fiber composites can be reprocessed without great losses in property for applications not subject to fatigue and/or impact loading.

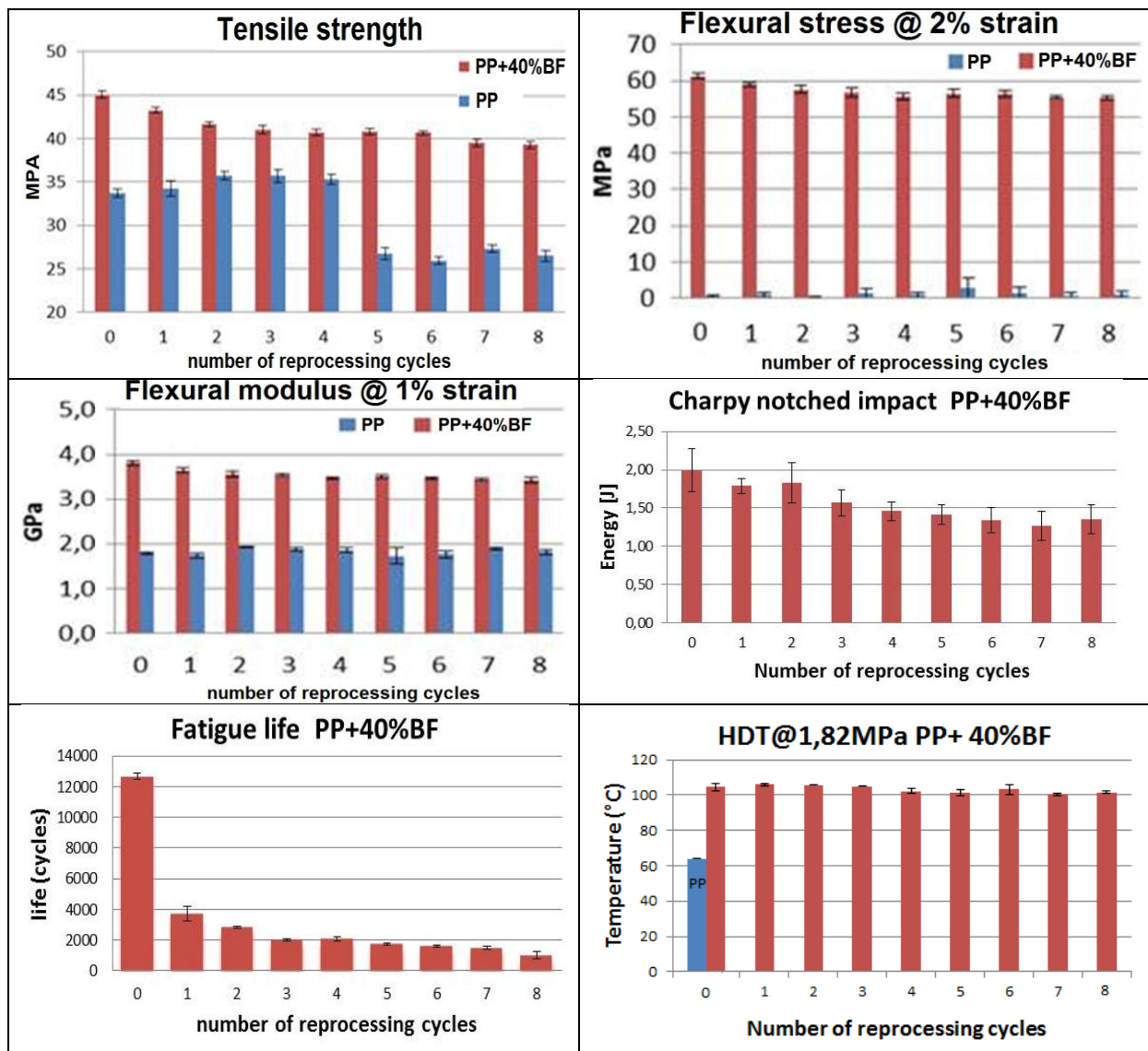


Figure 1 Variation in assessed properties of neat PP and PP reinforced with 40wt% bamboo fiber (BF) as a function of reprocessing cycles.

References

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