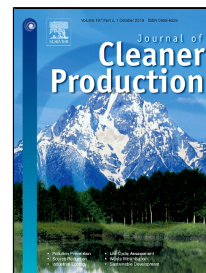


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Circular development of recycled natural fibers from medium density fiberboard wastes

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Abstract: This paper addresses a circular economy strategy for the medium density fiberboard (MDF) industry by effectively recycling fibers from MDF residues as raw materials, additionally reducing waste discharge, preserving the ecological environment, saving the wooden resources, and relieving the shortage of raw materials. The work specifically discussed the characteristics and bonding properties of the recycled fibers from the MDF offcuts by the cooking and beating method. The morphology of the recycled fibers was compared with that of the virgin fibers, and then the chemical characteristics of the recycled fibers were analyzed with XPS. Finally, the bonding properties between the recycled fibers and some virgin fibers were compared. The results showed that the fiber length of the recycled fibers is about 12% shorter than that of the virgin fibers and the percentage of shorter fibers ($\leq 0.68\text{mm}$) is higher for the former than the latter, in addition, the broken ends ratio of the recycled fibers is 17% higher than that of the virgin fibers, while there is no significant difference in the fiber width and its distribution. SEM and XPS characterizations confirmed that there are some cured UF resin on the surface of the recycled fibers. The MOE, MOR, and IB of the recycled MDF is 5, 10 and 11% respectively lower than those of the fresh MDF manufactured with the virgin fiber, but its TS is 12% lower than that of the fresh MDF, this means that the recycled fiber MDF is more dimensionally stable and water resistant.

Key words: MDF; Residue; Recycled fiber; Morphology; Characteristics; Bonding properties

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1. Introduction

Environmental impacts of industrial developments have evolved worldwide, in parallel to the increase in the world's population for a greater consumption of products and generation of wastes, which compromises a sustainable future (Severo et al., 2018; Severo et al., 2017; Severo et al., 2015). Relieving or even completely eliminating the impacts is the responsibility of all industry sectors (Maas et al., 2016) and the pressure on the

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