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In situ production of bacterial cellulose to economically improve recycled paper properties

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ABSTRACT

This study focusses on the in-situ production of bacterial cellulose in recycled pulps to increase the quality of fibers in the suspension. The effect of different dosages of the upgraded pulp on the mechanical, physical and optical properties of handsheets was assessed. Papers produced with pulps cultivated in agitation exhibited increments in both tensile and tear indexes of 12.2% and 14.2%, respectively. Thus, flexibility of the paper was also improved. On the other hand, pulps enhanced with static culture fail to improve tensile index of paper, while tear index was increased by 12.4%. The production mechanism for both types of culture was proposed. In agitated culture, bacteria were found to coat the primary fibers, improving their quality. In the case of static culture, heterogeneous systems were observed since recycled fibers tended to sediment while bacteria moved to the surface of the culture broth in search of oxygen. Hence, the in situ production of BC with recycled fibers can, therefore, be an alternative to replace conventional paper strengthening agents. The results attained indicate that the in-situ production of upgraded pulps can be implemented in paper mills cultivating pulp streams sterilized through low cost, non-exhaustive operations, such as ozone or ultraviolet radiation.

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