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Production of bleached cellulose from recovered cardboard



May 27, 2019, Lucas Dollié defended his doctoral thesis of the University Grenoble Alpes, prepared under the supervision of the Professor Gérard Mortha, and of Nathalie Marlin, Associate Professor (Grenoble INP-Pagora/LGP2). He presented the results of his research work entitled *Concepts and developments for the production of bleached, pure or oxidized cellulosic pulp from recycled lignocellulosic material*.

Today recovered papers and boards are recycled into similar products; in particular old corrugated boards are transformed into new corrugated boxes. Rich in lignocellulosic material, recovered carton boards might replace wood for the production of higher added-value products. The thesis work investigated the potential of existing processes for delignification, bleaching and cellulose purification, applied on fiber mixes simulating the composition of various carton boards, for the production of bleached paper pulp and dissolving pulp grades.

The treatment was composed of a Kraft cook, followed by a conventional D0-Ep-D1 bleaching sequence, and in the case of dissolving pulp production, a CCE stage for cellulose purification was added. Because carton boards exhibit various fiber compositions, all the study has been conducted on model mixes, made of fibers from unbleached Kraft pulp and mechanical pulp. In all cases, fully bleached pulps have been successfully obtained, although pulp viscosity was sometimes below the standards. Moreover bleached pulps were found difficult to purify. Overall, it has been shown that the quality of the final product, the performances of the processes and their environmental impact, depended on the fiber composition of the mix. Finally, the treatment of an industrial carton board revealed that mineral fillers contained in the material limited its upcycling.

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Because of the low quality of the bleached pulp produced, another valorization way has been investigated: the production of oxidized cellulose for cellulose nanofibrils (NFC). A new pre-oxidation process for unbleached Kraft pulp has been developed, combining bleaching and oxidation of the substrate in a single stage including the use of TEMPO as a catalyst and oxidative agents commonly applied in fiber production lines. NFC of the same quality as those produced from bleached Kraft pulp by the classical TEMPO/NaClO/NaBr pre-oxidation system have been obtained.

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