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Valorization of the fibrous rejects from paper and cardboards recycling process

Valorisation des déchets fibreux issus de la filière de recyclage papier-cartons

Biochip

Context

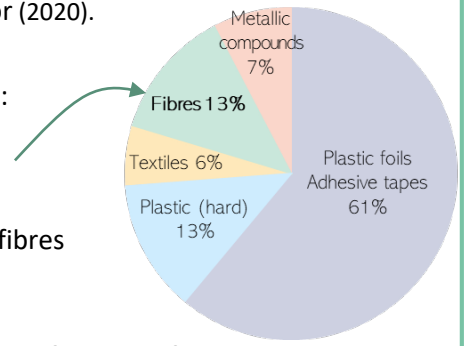
Paper and cardboards (PC) recycling process[1]

- 4.9 Mt of recovered PC in France/year, including

4 Mt for packaging sector (2020).
└ 93% recycled into PC
Among the 7% waste:

13% of fibrous rejects

= 36 kt of non-valorized fibres per year in France.



Lignocellulosic high value products

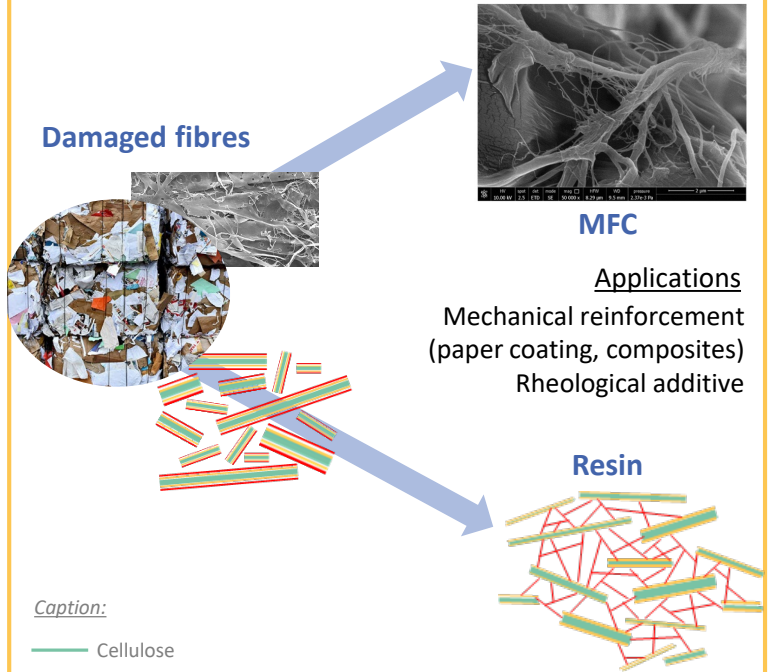
- EU directives (Green Deal) on reducing consumption and replacing of petroleum-based products.
- High demand of cellulose and lignocellulosic compounds for ubiquitous applications.

= high demand of virgin fibers and pure bio-compounds representing high energy and chemical consumption.

However, for some applications, non-pure and damaged cellulose from paper recycling process could be used.

Objectives

Development of valorization methods tailored to the fibre quality and contaminant nature



Methods

Characterization of rejects

Chemical: %cellulose, %hemicelluloses, %lignin, %stickies,...
functional groups analysis (COOH, CHO, phenol,...)
Physical: Fibres morphologies and specific areas.

MFC production[2]

Rejects or model compounds → Chemical fibrillation + delignification with TEMPO oxidation → Mechanical fibrillation

Resin production

Rejects or model compounds → Chemical depolymerization → Fractionation → Stickies elimination or dispersion / Cellulose and hemicellulose carbonylation / Lignin amination → Reticulation via drying

Characterization of MFC and resin

Mechanical, thermical, chemical and optical characterization.

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[1] K. Guiltaux, et al., ADEME 2023. Perspectives d'évolution de la filière papiers-cartons en France. 79 pages
[2] L. Dollié, Thèse Université Grenoble Alpes, 2019