Types, quantities and heavy metal content of the finishes on fibreboard waste

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Context and objectives

Fibreboard is one of the main types of wood-based panels. EN 316 give a definition of a fibreboard: “panel material with a nominal thickness of 1.5mm or greater, manufactured from lignocellulosic fibres with application of heat and/or pressure” (AFNOR 2009).

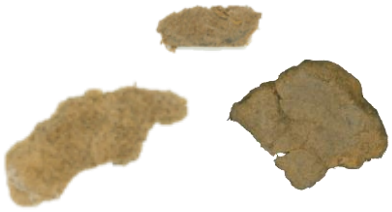
Medium Density Fibreboard (MDF) is the second most produced wood-based panel in the world and global production capacity continues to increase (Organisation des Nations unies pour l’alimentation et l’agriculture 2022). As products made with MDF have an average lifespan of 14 years (Irle et al. 2019), they are rapidly converted to waste. This phenomenon leads fibreboard residues to be an increasingly important part of the recovered wood stream. Moreover, this flux is not easily incorporated as a secondary raw material for particleboard. Indeed, too much fibreboard residues in the mix leads to lower mechanical properties of particleboards (Lee et al. 2022). EcoReFibre, project funded by the European Union, proposes the creation of a sorting machine to separate fibreboard residues from the wood waste. These ones are various: from different types of fibreboards, sizes, without or with coating on the top… This last category is interesting to analyse as it can be expected to be more difficult to recycle due to possible chemical contamination. It is therefore important to characterize this fraction in order help imagine efficient recycling methods for this material.

Material and methods

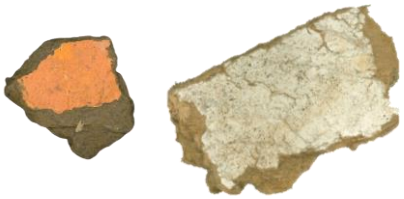
A collection of wood waste is carried out in France since July 2022 as part of EcoReFibre project. The material is first sieved to keep only the largest particles: the ones retained in an 8 mm mesh as they represent the biggest part of the sample and are easily recognisable and distinguishable. These particles are picked by hand into 4 categories: solid wood (“SW”), panels such as Plywood-OSB-Particleboard (“POP”), non-wood (“NW”) and fibreboard (“FB”).

The fibreboard fraction is set aside and labelled according to its origin. Every fraction is then sort according to 4 different types of coating (Fig. 1) as they might have different compositions.

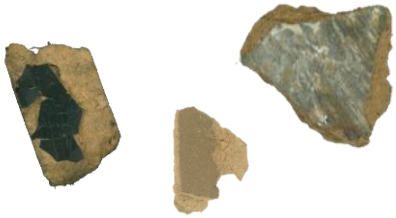
As the purpose of the study is to evaluate the pieces with a view to their recycling, an X-ray fluorescence (XRF) spectrometer is used to detect elements on the surface of the coating. Each pile sampled is represented by 3 bags in average. For each bag, a piece of each sub-category is taken and put under the XRF machine. It is possible that not all four categories of finish are represented in the bag. An acquisition time of 60 s was used for the XRF measurements. The specimen was moved after each measurement so that 5 measurements covered the entire surface of the finish.



Transparent finishes and adhesive residues



Light finishes such as paint or flexible coatings



Hard finishes or thicker coats

Wood-based finishes (veneer residues, particleboard, etc.)

Fig. 1: The 4 different categories of finishes

The chemical analysis is performed, based on elements assessed by the European Panel Federation. The document "EPF standard for delivery conditions of recycled wood" (EPF 2002) gives limit values concerning the chemical contamination (see Tab. 1).

Tab 1: Limit contamination values for recycled wood (EPF standard)

Elements	Limits values (mg/kg recycled wood)
Arsenic (As)	25
Cadmium (Cd)	50
Chromium (Cr)	25
Copper (Cu)	40
Lead (Pb)	90
Mercury (Hg)	25
Chlorine (Cl)	1000
Fluorine (F)*	100

* Not detectable by the XRF device

Results

A poster will include the first results of this study.

Acknowledgement

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