

DEVELOPMENT OF A RECYCLING PROCESS FOR PARTICLEBOARD

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Introduction

The extensive use of wood-based panels has led to significant volumes of waste, either generated during secondary processing or when they reached the end of their life cycle. The major problem in recycling waste particleboard panels is the presence of amino resins containing formaldehyde. This makes recycling a complex, limited, and challenging process. One alternative method for recycling these wastes is hydrolysis, which can give them a second life by using them as raw materials to create new materials. These residues have great potential as valuable raw materials for producing new and sustainable products

This research aims to develop a process for recycling particleboard residues through chemical hydrolysis to obtain raw materials suitable for manufacturing new panels

Methodology

1 PARTICLEBOARD RECYCLING BY ACID HYDROLYSIS



Experimental Design

ID	Reaction time (min)	Chemicals	Concentration %
T0	60	Water	-
T1	30	Sulfurous acid	1
T2	30	Sulfurous acid	2
T3	30	Oxalic acid	1
T4	30	Oxalic acid	2
T5	30	Ammonium chloride	25
T6	30	Ammonium chloride	30
T7	60	Sulfurous acid	1
T8	60	Sulfurous acid	2
T9	60	Oxalic acid	1
T10	60	Oxalic acid	2
T11	60	Ammonium chloride	25
T12	60	Ammonium chloride	30

Characterization of Recycled Particles

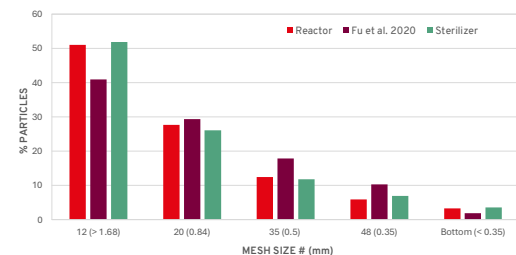
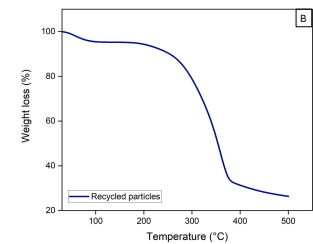
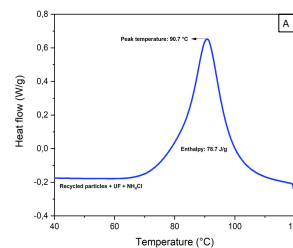
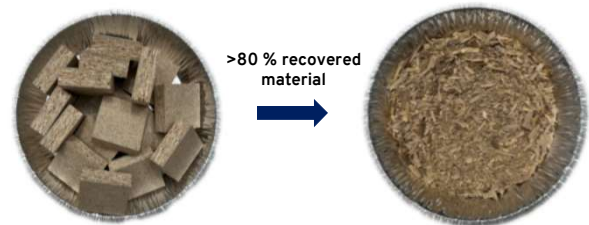
- Granulometric analysis: Particle size distribution
- pH and acid/buffer capacity
- Nitrogen content: Perkin Elmer 2410 Series II Nitrogen Analyser
- Thermal stability: Thermogravimetric analysis (TGA)
- Urea-formaldehyde resin + recycled particles curing behavior: Differential scanning calorimetry
- Gel time of urea-formaldehyde resin in the presence of recycled particles

2 PARTICLEBOARD MANUFACTURING

- Panel preparation using a Dieffenbacher North America hot press
- Physical and mechanical properties: ASTM D1037-12 (R2020), ANSI A208.1
- Formaldehyde emissions: ASTM D6007-22 using a small-scale chamber

Results

Preliminary Tests



A) Urea-formaldehyde resin + recycled particles curing behavior B) TGA curve of recycled particles C) Particle size distribution

Expected Results

1. Determine the impact of acid hydrolysis on the removal of cured UF resin from particleboard wastes
2. Determine the optimum proportions of recycled and virgin particles to produce new panels
3. Produce panels with properties that meet standard requirements

Conclusions

Using the proposed method will help us figure out how acid hydrolysis with different acid solutions affects the removal of cured UF resin from wood-based panel residues. This will help us find the best conditions for the process. By recycling wood-based panel residue, manufacturers can reduce their environmental impact and support sustainable development

