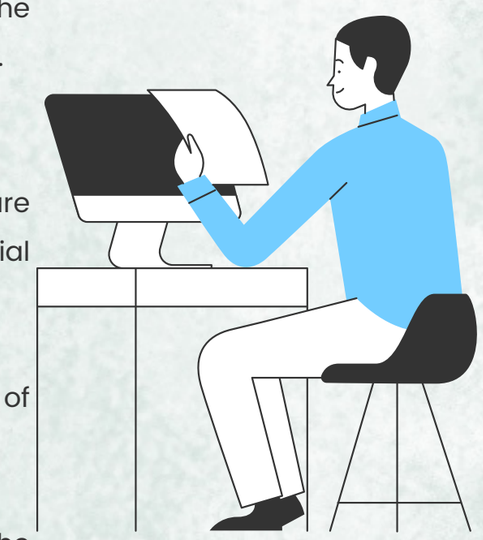
**Thesis Title:**

# The use of recycled polymers in architecture and design: Large-scale 3D printing method

## I-Research Background and Motivation:

Background: master's degree in Architecture from the institute of fine Art of Foumban (Cameroon) in 2020.



Motivation for the research:

- Come up with an innovative technic or procedure to use recycled polymers as a building material through 3D printing.
- Provide a solution to the problem of lack of housing
- Bring out a solution to the pollution of the environment due to plastic waste.

## II- Objectifs

- Propose a long-term solution to the issue of sustainable development of cities.
- Reduce plastic pollution
- Offer an alternative way of recycled plastics waste

## III-Research Questions

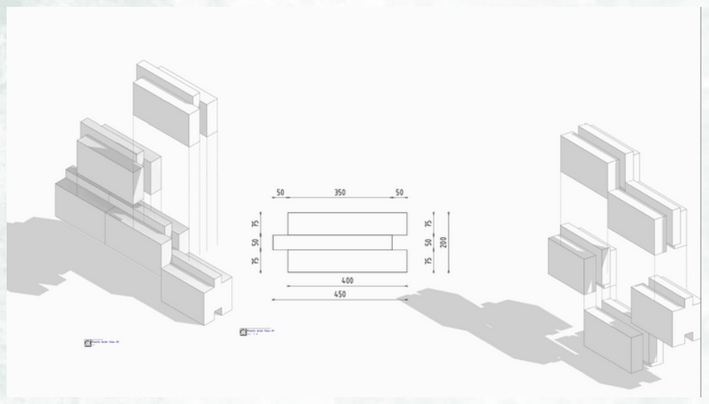
- How to use recycled polymers in architecture and design using large-scale 3D printing methods?
- In which aspect can we combine recycled polymers with other materials like concrete in other to improve its properties as a building material?

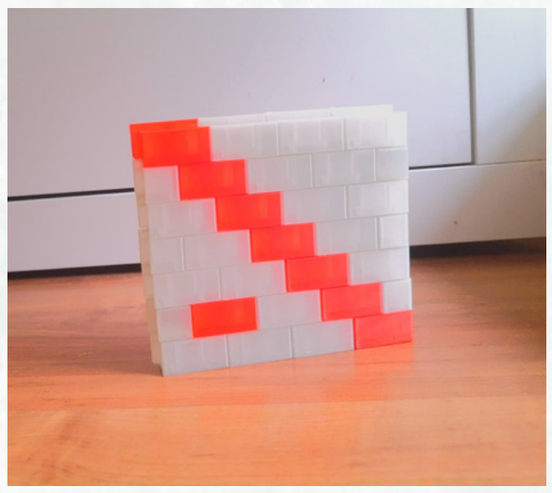
## IV- Methodology

1. An inventory study of the existing waste polymers:
2. Digital simulation with Revit and Dynamo or Rhinoceros and Grasshopper
3. Design of an advanced flow coupling BIM technics with 3D printing process
4. Printing of a real prototype

## IV- Research Results for the first year

For the first stage of our research, we tried to do a literature review of our topic. It helps us to define the shape of a brick and it brings us to do some experiments



### First model: press process

Dimension: 25cm ×7.4 cm × 8.5 cm

Weight: 0,63kg

### Second model:3D printed brick

Dimension: 25cm ×7.4 cm × 8.5 cm

Weight: 0,63kg

printing setting: 75% infill

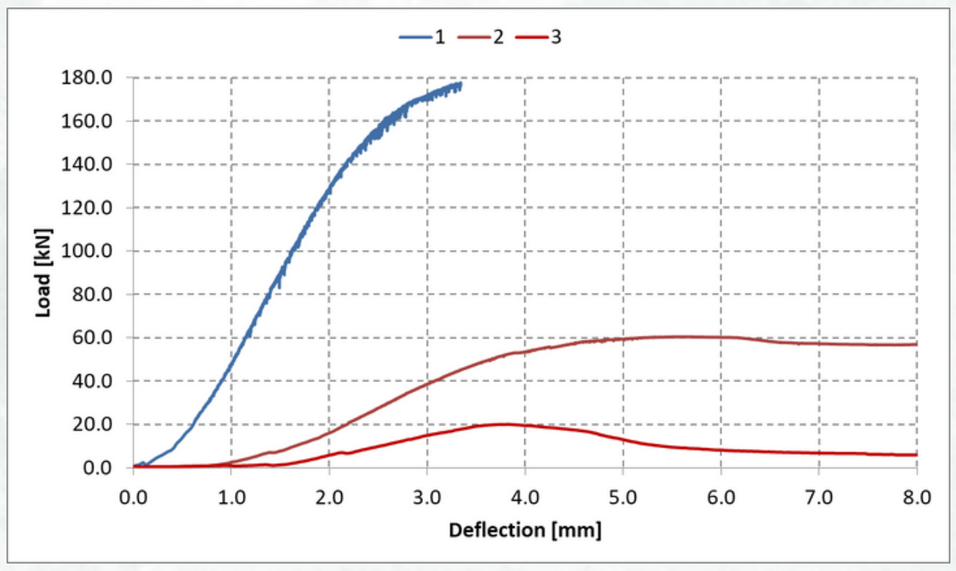
### First model:3D printed brick

Dimension: 25cm ×7.4 cm × 8.5 cm

Weight: 0,73kg

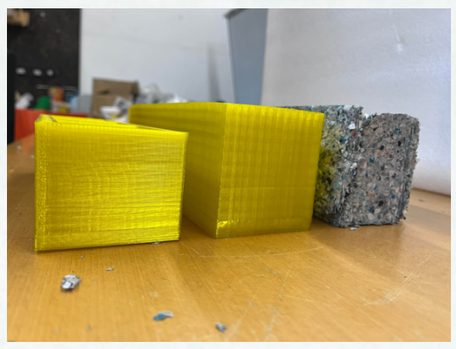
printing setting: 90% infill

The following picture show the diagram of deflection of each model




## VI- Conclusion

- The outcome is that the material is not homogenous. It should be transformed into powder and melted
- For the future research, some simulations with software like Revit and Dynamo or Rhinoceros and Grasshopper can help us to better understand the chemical and physical properties of recycled plastic.



Author : Paulin Faskel Tchoundie Tchuigwa
Supervisor : doc. Ing. arch. Kateřina Sýsová, Ph.D

FACULTY OF ARCHITECTURE OF CZECH TECHNICAL UNIVERSITY IN PRAGUE.
Ph.D Workshop 2023

CTU
CZECH TECHNICAL UNIVERSITY IN PRAGUE