Valorization of sediments in bio-based materials. Application to fluvial sediments with use of tropical fibers

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Objectives

- Recycling dredged sediments and fibers waste in earth bricks.
- Implementation of sediments and fibers in eco-bricks.
- Transfer the methodology to Normandy river sediments and fibers waste.

1. Raw materials

- Sediments from Usumacinta River, Mexico.
- POFL fibers from Tabasco, Mexico

2. Methodology

- Characterization of dredged sediments.
- Characterization of palm oil flower fibers (POFL).
- Recovery of sediments and POFL fibers in earth bricks.

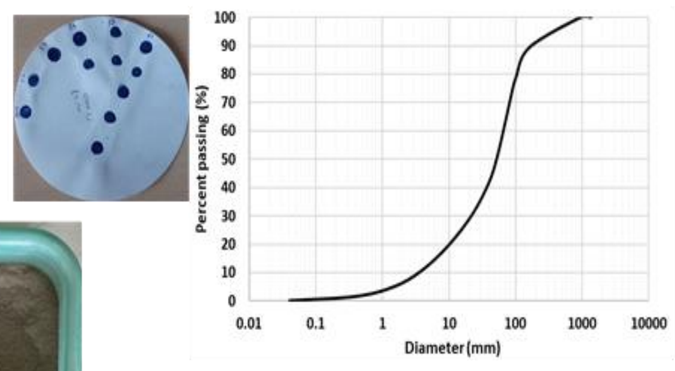
3. Applications

- Earth bricks manufacturing (Tabasco state, Mexico).
- Earth bricks with sediments and fibers from Normandy.

Dredging, Transportation, Drying, Grinding

Characterization
Granulometry, Atterberg limits, Methylene blue value, XRF, Permeability, Carbonate content, organic matter

USU sediments



4. Characteristics of Usumacinta sediments and POFL fibers.

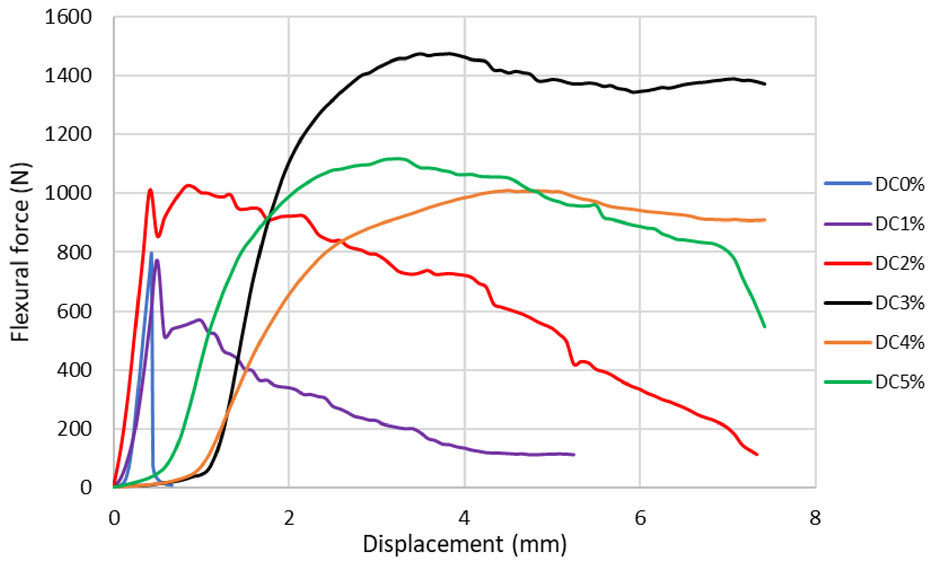
Sediments	LL (%)	psed (g/cm^3)	Clay (%)	Sand (%)	pH (-)	OM (%)	MBV (g/100g)	$CaCO_3$ (%)	Wopt (%)	SSA (m^2/g)
J3	37.7	2.6	5.9	52.8	7.5	4.5	2.7	7.8	19.3	28.2

Fibers	σt (MPa)	Density (g/cm^3)	Water absorption (%)	k (W/mK)	Cellulose (%)	Length (mm)	Area (mm^2)
POFL	104.3	1.37	235	.058	48.84	11.5	.07

Note: PL = Plastic limit, SSA = Specific surface area, σt = tensile strength

5. Tensile strength

σt (MPa)	DC0(%)	DC1(%)	DC2(%)	DC3(%)	DC4(%)	DC5(%)
Bricks	1.79	1.56	2.37	2.37	2.93	2.38



Tensile strength and tensile load - deflection curves vs fibers

6. Work Planning

- Preparation of sediments: drying, crushing and grinding.
- Bricks specimens manufacturing for tensile and compressive strength.
- Optimization of bricks strength with compaction and fibers content.
- Study of the mechanical characteristics of crude bricks.
- Observation of fibers distribution and orientation in crude bricks.
- Determination of thermal performance of crude bricks.

Conclusions

- Crude bricks maximum tensile strength is observed for 4% fiber content
- Crude brick average linear shrinkage is 2.25%.
- Density of crude bricks at optimum fibers addition is around 1524 kg/m^3.
- Fibers occupy 6-7% area of the crude brick cross-section.
- Thermal conductivity of bricks is measured around 0.23 W/mK.

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