Greywater purification in prefabricated façade elements derived from construction and demolition waste

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Vertical ecosystem®

FP7 project
Nature-based greywater treatment for on-site water reuse

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Prefabricated façade element

Green Wall
Plants included in the panel for grey- and stormwater management

Geopolymer Layer
Geopolymer matrix from CDW, clay, bricks, wood fibres, glass, and tiles

Recycled plastics
Roots grow in substrate consisting of fibres and expanded clay

Air Gap

Recycled Aluminum Frame
Produced by extrusion

Polyurethane Insulating Foam
Polyurethane insulating foam from PU waste with additives and reinforcing fibres

Magnesium Oxide Cement
MOC with fibres, aggregates and PCMs

Photocatalytic Layer
Doped TiO₂

Reinforcing fibres
Reinforcing fibres from wood and textiles
Functional green wall
Geopolymer planting tests

- Geopolymer causes very high alkalinity in water
- Too much salts are leached out (almost sea-water like)
- Not enough water proofing – mineral salt efflorations
- Strength to weight ratio unfavourable for enclosing construction
Search for alternatives

... then Grenfell Tower happened

- Plastics considered, but...
- Many unwanted additives (plasticizers, UV-stabilizers, colorants, flame retardants)
- Optics look quite cheap
- Not very economical for prototypes

- Aluminium seems to fit
- Is great for recycling
- CDW origin possible
- CDW-broken brick chips as substrate
- High CDW-content in final solution
Solution

Current solution, >92% w/w CDW material content possible

- 2 Cassette type panels & 10 channel types currently in testing in Vienna
- 2 Cassette types in Terrassa for biological and functional tests
- 4 m² to 8 m² of panels planned for tests in Sevilla and perhaps Italy
Composition

Varying substrate compositions

Same plant composition

Greywater treatment after passing two of each columns

Brick mixture A  Brick mixture B  Brick mixture C  Brick mixture D  Seramis

1  2  3  4  5

1  2  3  4  5

aprox. 2 dozen plant species tested,
several more under study
Performance

![Graphs showing performance metrics such as Turbidity, COD, and BOD.](www.alchemia-nova.net)
Application

[Diagram of a sustainable house with green roofs, solar panels, and water recycling systems]
Outlook
Outlook

Concept for the four secondary building blocks: 1: Structural / insulating component; 2: Structural / insulating component with solar thermal; 3: Structural / insulating component with green wall; 4: Structural / insulating component with green wall and semipermeable PV
Vision

Treescraper, William McDonough, Cradle to Cradle

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Thank you for your attention!
We are looking forward to implement further circular economy solutions!