Recy & DepoTech 2022

MISKOLCI EGYETEM
UNIVERSITY OF MISKOLC

The Use of Textile Waste for Fibre-Reinforced Geopolymer Composite Production

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9-11. November 2022

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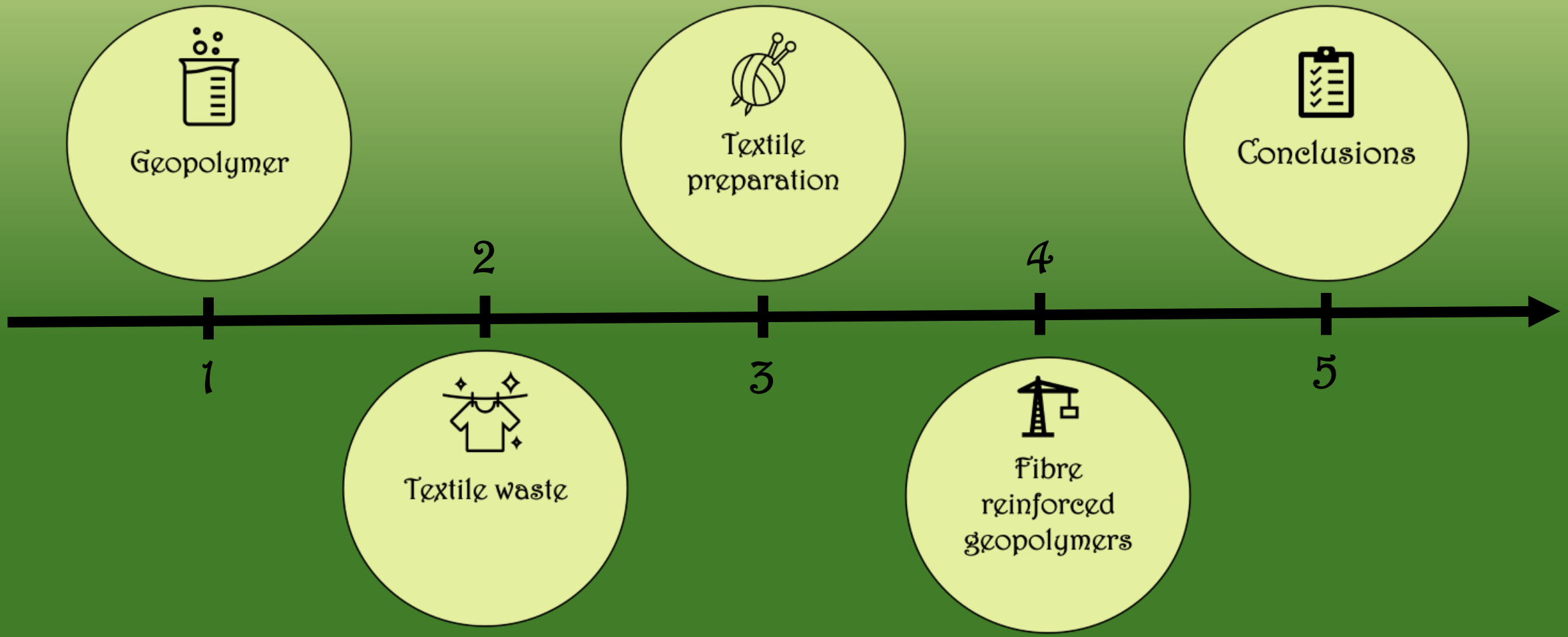
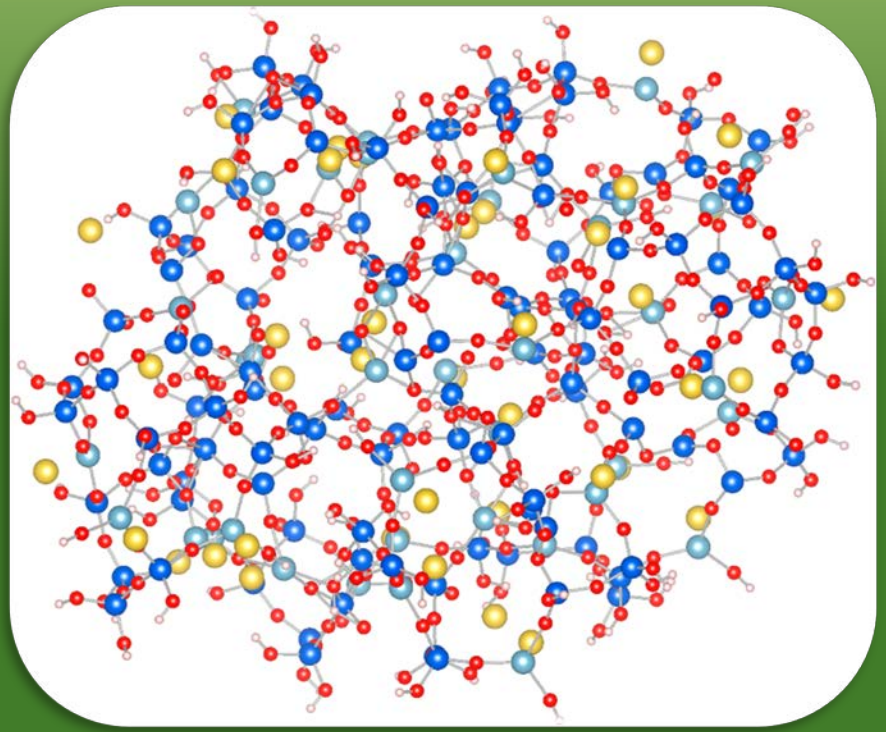


Geopolymer

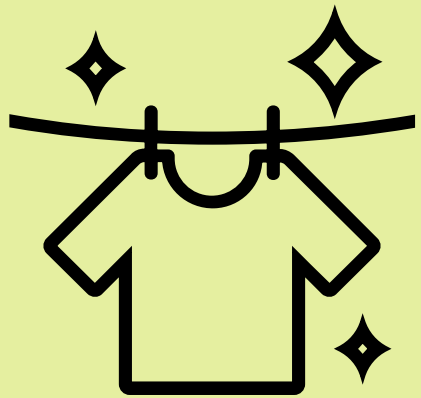
Geopolymer

Activator solution

Solid base material

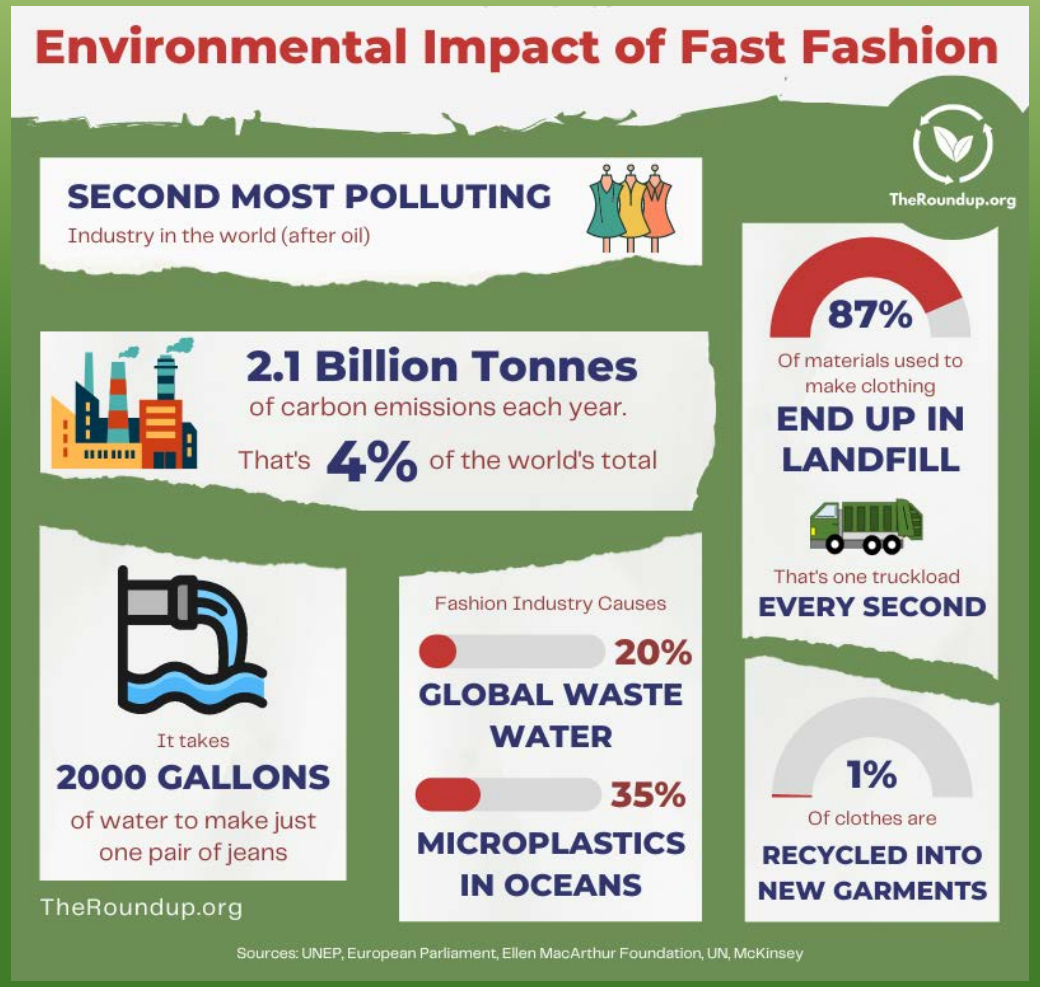


Structural model for geopolymer of over 800 atoms with Si:Al ratio of 2.81 (Koleżyński et al., 2018)



Textile waste

Textile waste



Textile waste from the industry

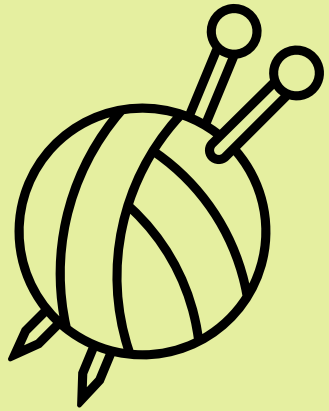
Unsellable textiles

Textile waste from costumer

Sorting process → Reusable

Chemical recycling

Mechanical recycling

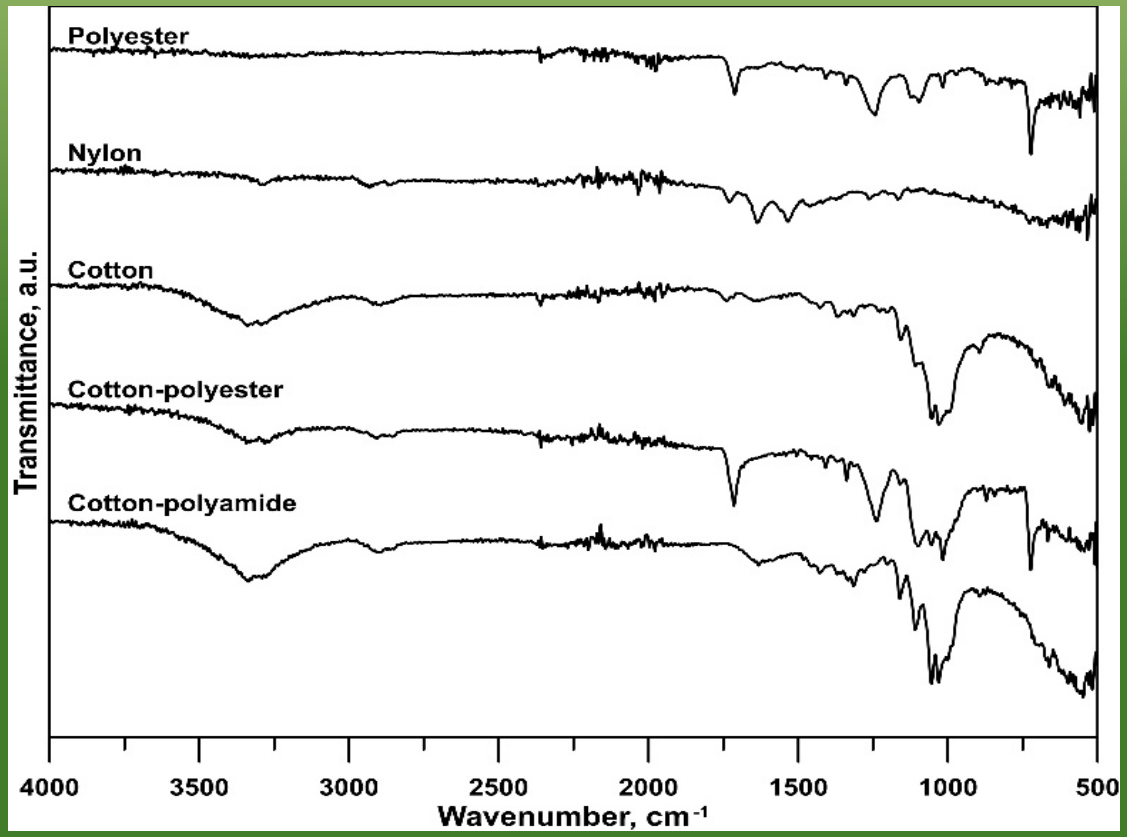


Textile preparation

Textile preparation

Base material

Fibre from textile waste



FT-IR spectra of the textile samples

Textile preparation

Axial rotary shear shredder

Vertical cutting mill

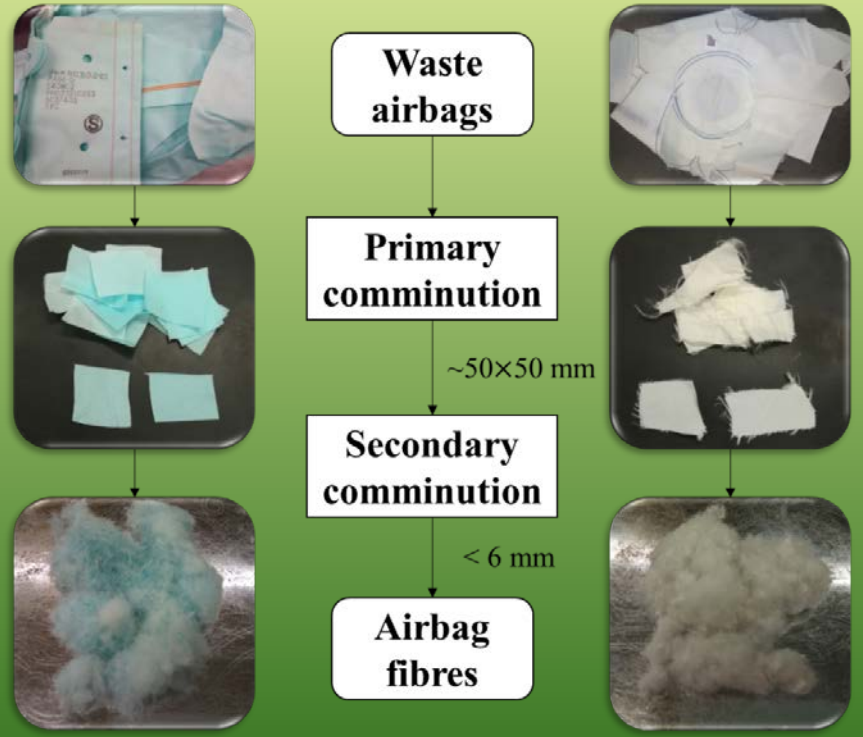
Horizontal cutting mill

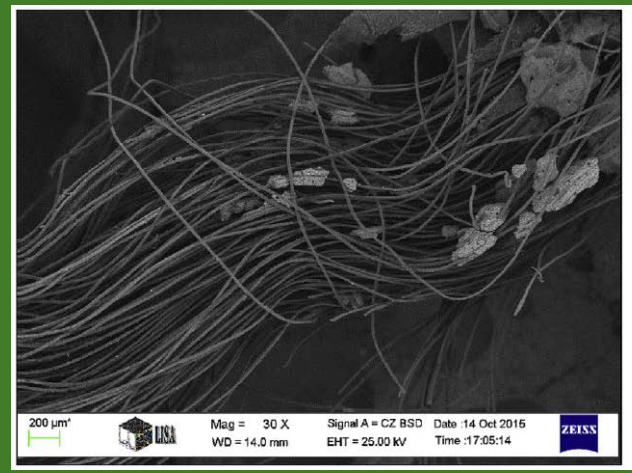
Fibre reinforced geopolymers

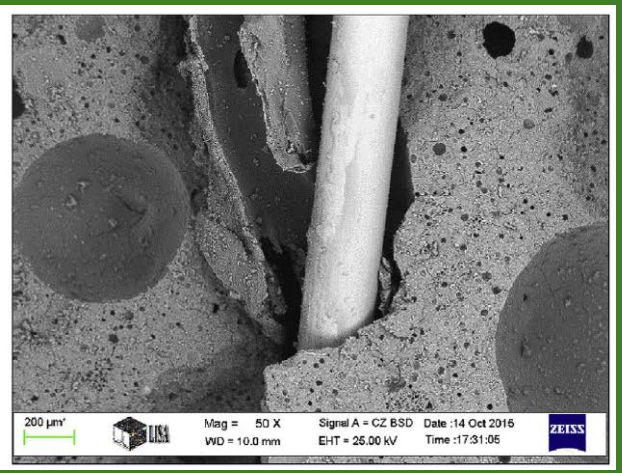
Fibre reinforced geopolymer from synergetic utilisation of fly ash and waste tire

Fibre reinforced geopolymers

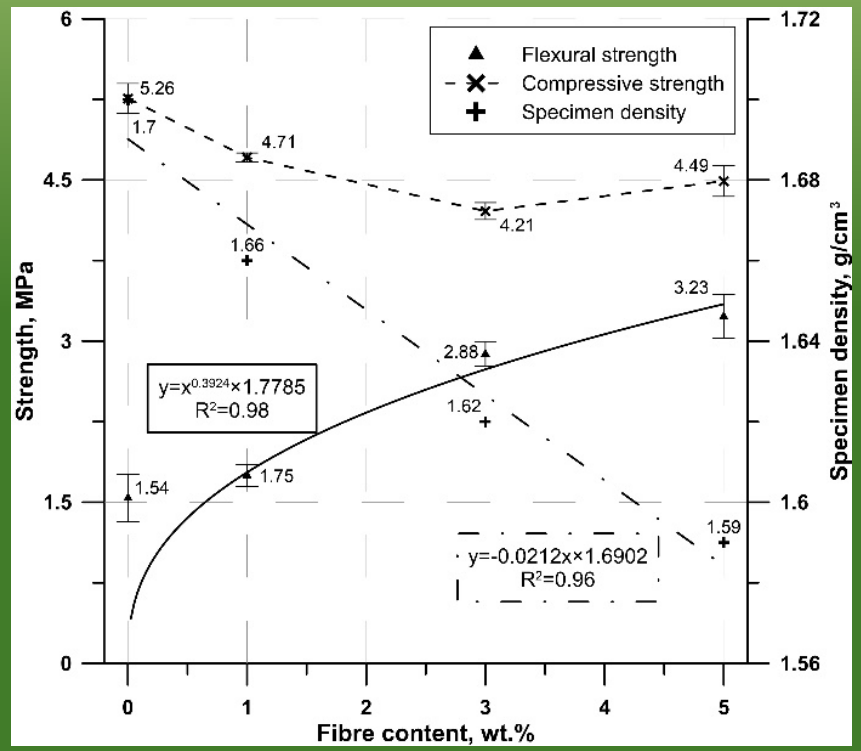
Preparation and Synergetic Utilisation of Waste Polymer Fibres and Fly Ash as Geopolymer Composite



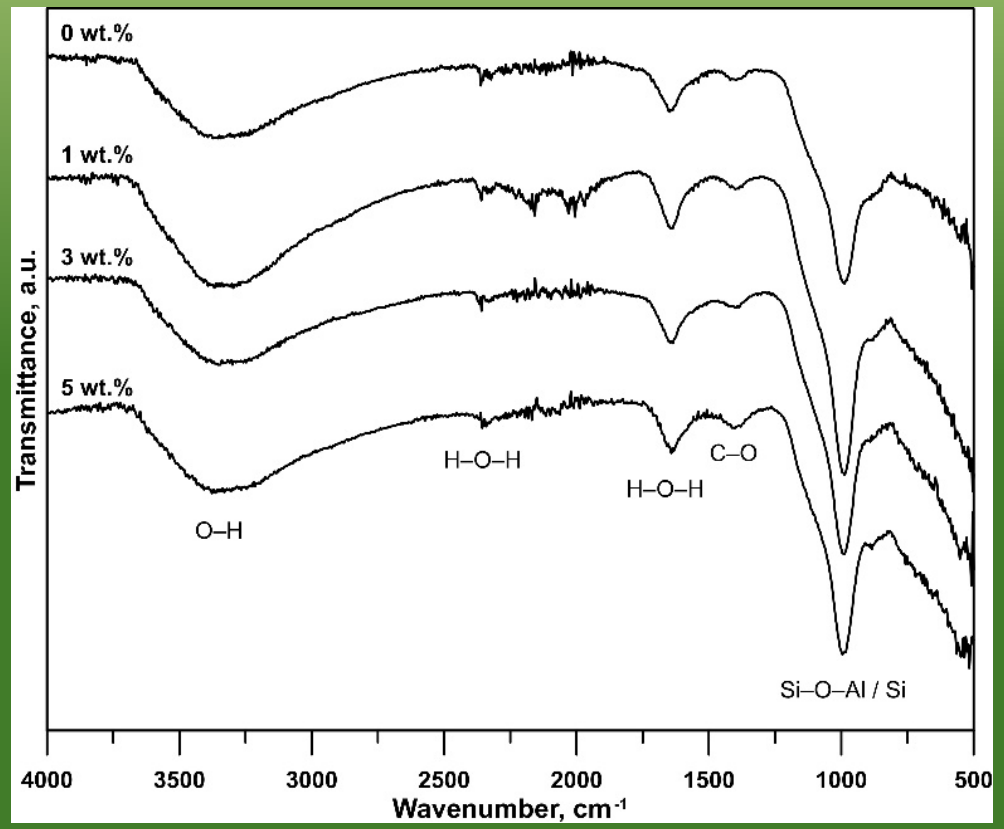




Fibre reinforced geopolymers

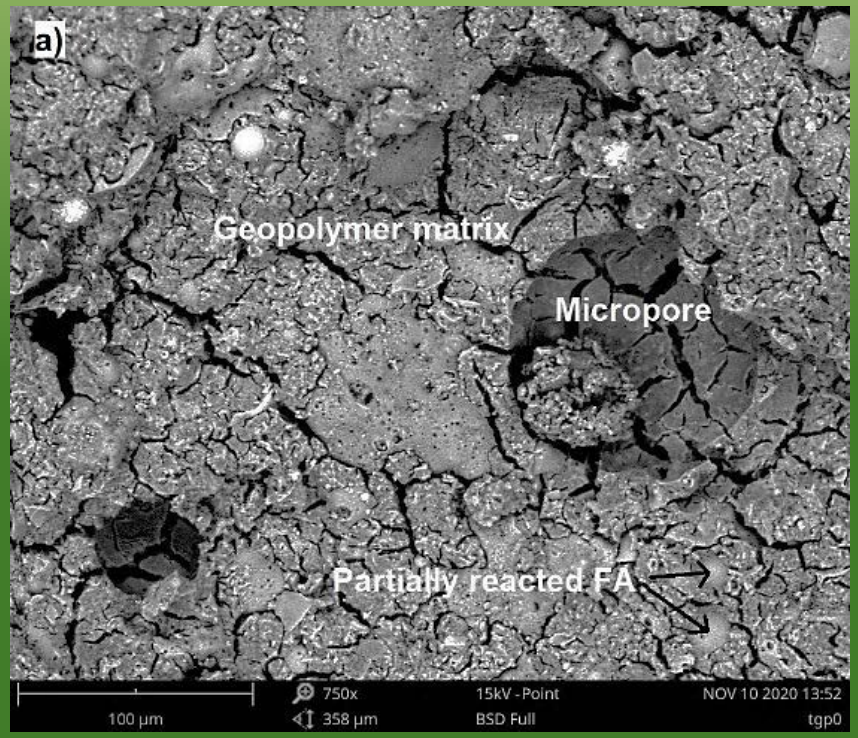


Physical properties of geopolymer composites



FT-IR spectra of geopolymer composites

Fibre reinforced geopolymers



Spot 1		Spot 2	
Element	wt.%	Element	wt.%
Si	33.13	O	46.50
C	23.17	Si	32.32
O	21.32	Na	6.85
Al	10.53	Al	6.66
Fe	4.72	Fe	3.85
Na	4.15	Ca	2.33
K	1.23	K	1.13
Mg	1.05	Mg	0.35
Ca	0.71		

SEM and EDS of the composites

Conclusions

Conclusions

- With 2-step communition, fibres can be produced from cotton-based and synthetic polymeric textiles.
- The flexural strength could be successfully increased, but the compressive strength was slightly decreased, along with the specimen density.
- The fibres successfully penetrated the geopolymer gel, and good adhesion was observed.

Thank you for your attention!

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