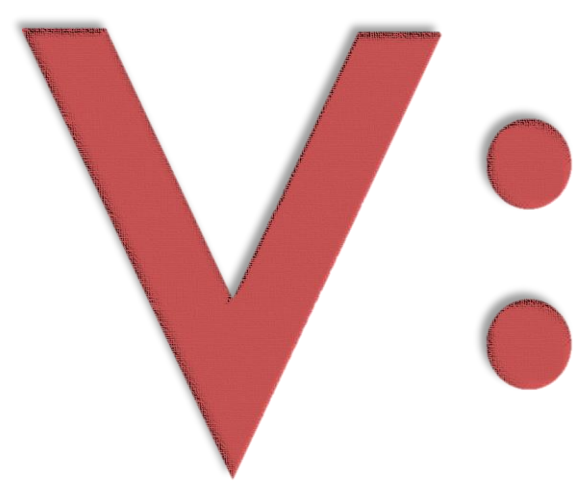




Synthesis and characterization of bottom wood ash metakaolin-based geopolymer

VERONICA VIOLA¹, MICHELINA CATAURO¹ AND ALBERTO D'AMORE¹

¹Department of Engineering, University of Campania "Luigi Vanvitelli", Via Roma n. 29, 81031 Aversa, Italy

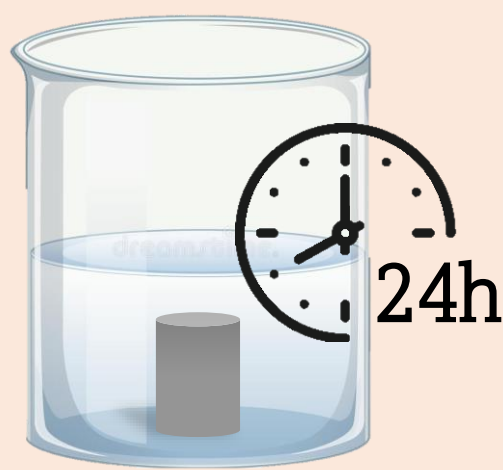


Abstract

The waste left over after burning wood and wood products is known as wood ash (WA). 6 to 10 % of the ash produced by burning wood is disposed of in landfills, even though some wood ash may be recycled. One of the alternatives to give this waste a second life is to use it as filler in geopolymeric materials. In this study, geopolymers (GP) are realized using metakaolin, NaOH, sodium silicate, and different percentages of WA (10, 20, 30%). The characterization of samples occurred at different aging times (7, 14, 28, and 56 days) to assess their mechanical, biological, and chemical properties. The article's research techniques include integrity, weight loss, water boiling test, pH and conductivity measurements, antibacterial activity, FT-IR analysis, durability test using mosses, and mechanical strength.

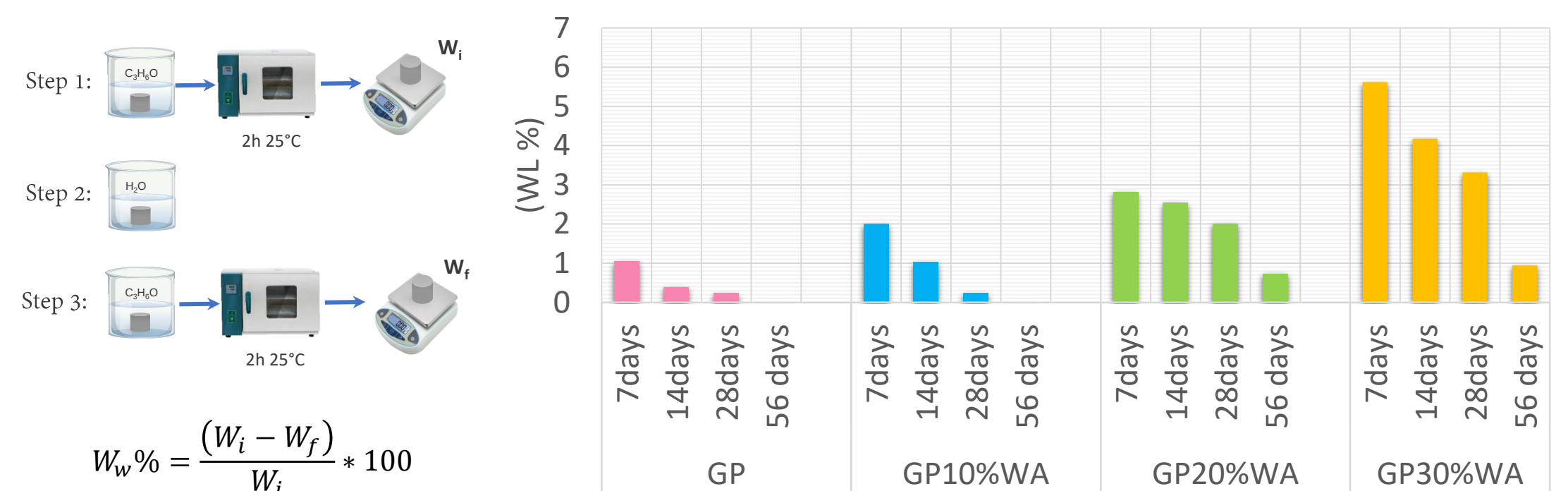
Methods & Results

Integrity

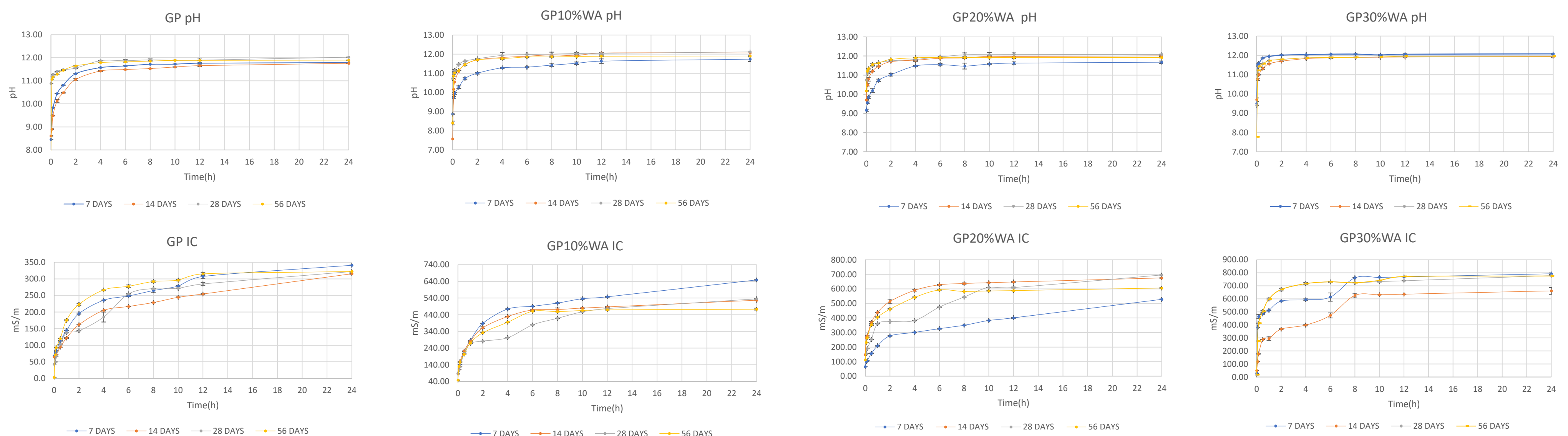


Time (days)	7	14	28	56	
pH	8.2	9.2	9.55	8.75	GP
Integrity	full	full	full	full	
Water appearance	clear	clear	clear	clear	
pH	8	9.88	10.05	9.84	GP10% WA
Integrity	full	full	full	full	
Water appearance	clear	clear	clear	clear	
pH	7.8	10.4	10.21	9.98	GP20% WA
Integrity	full	full	full	full	
Water appearance	clear	clear	clear	clear	
pH	10.34	10.09	10.28	10.02	GP30% WA
Integrity	full	full	full	full	
Water appearance	clear	clear	clear	clear	

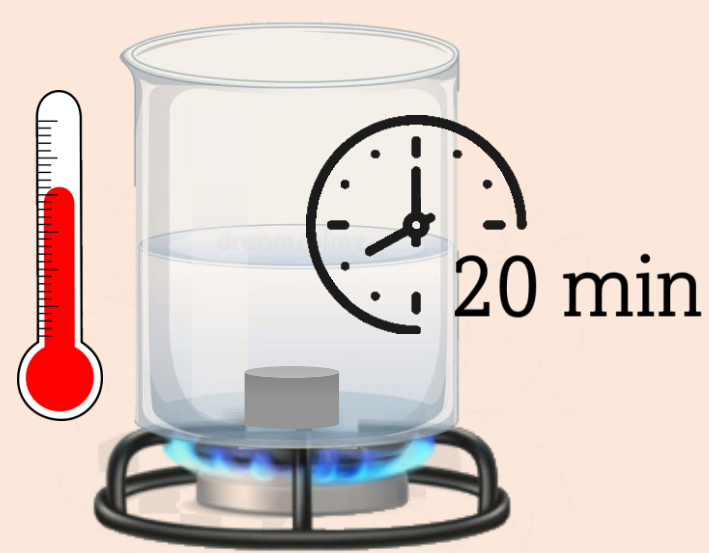
Weight Loss



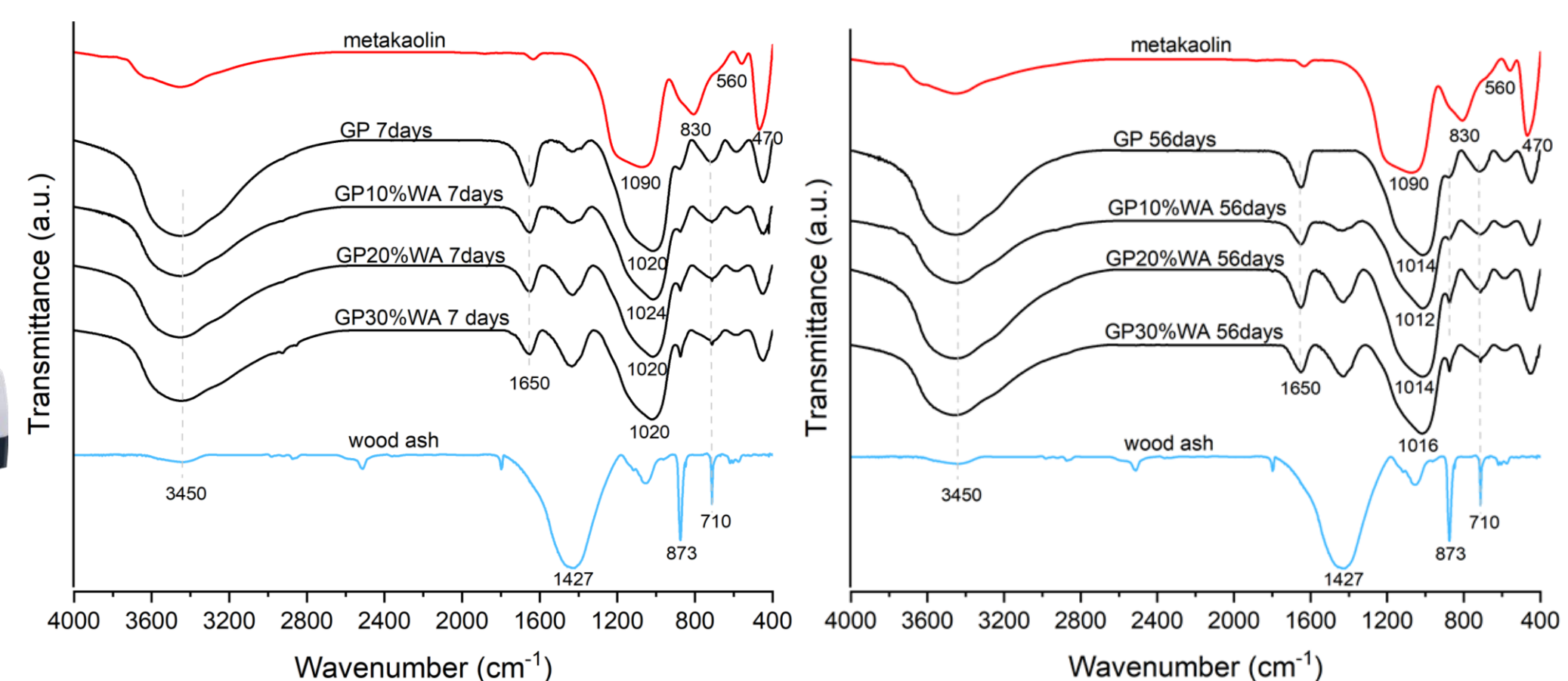
pH and Conductivity



Water boiling



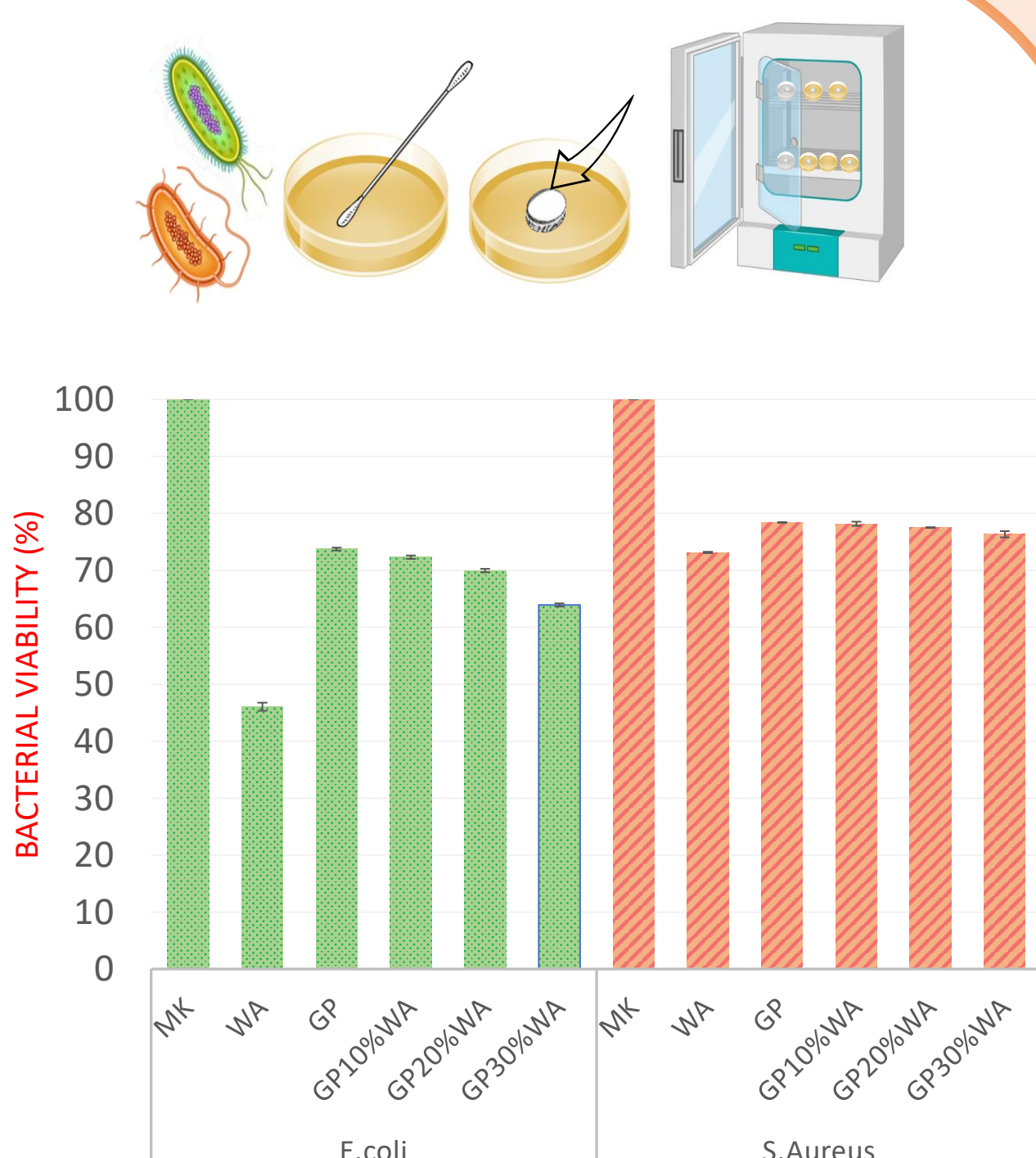
FT-IR



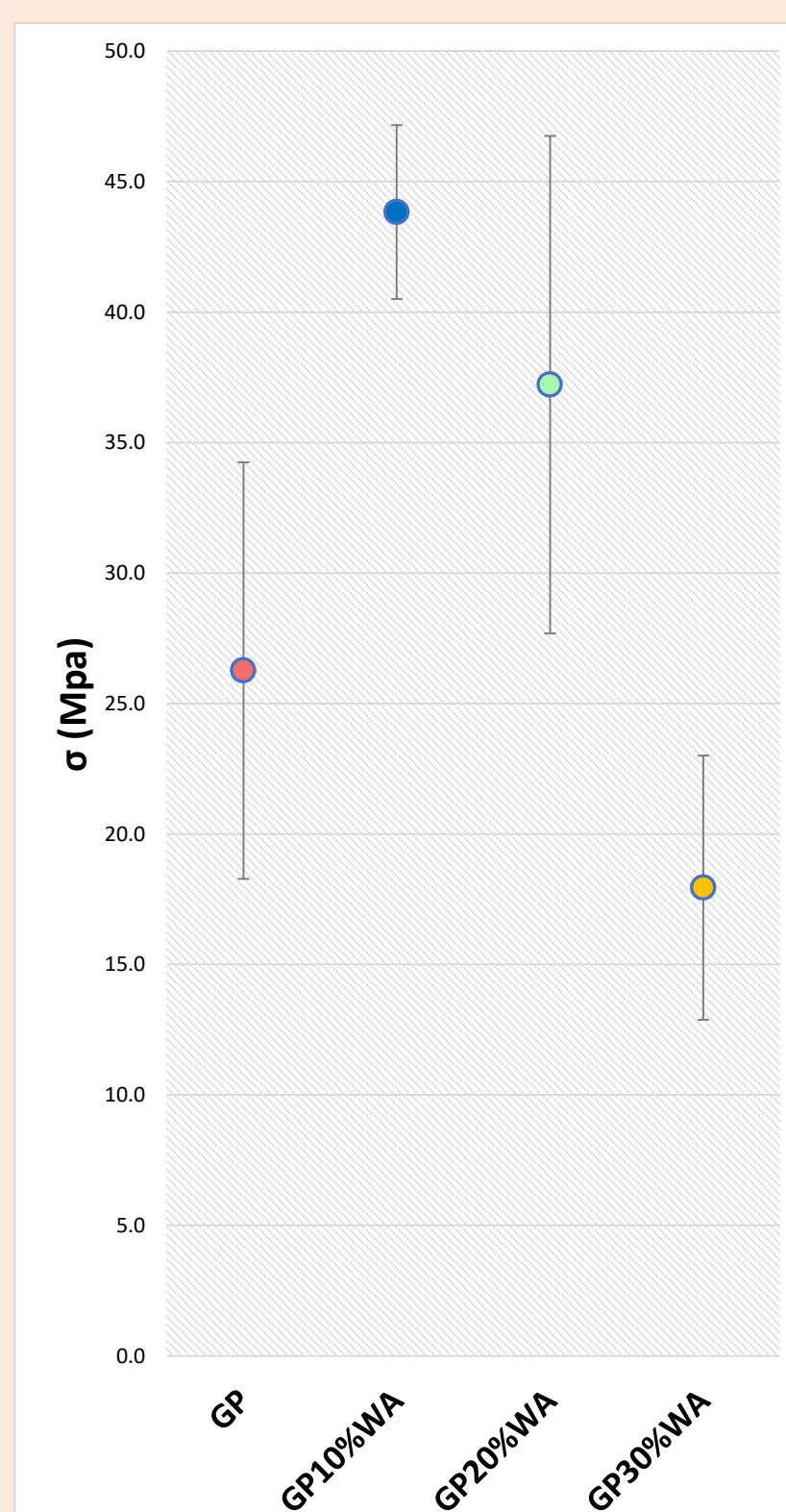
Durability

	CEM II	GP	GP30%WA
Mosses growth	✓	✗	✗

Antibacterial assay



Compressive Strength



Conclusion

- The synthesized geopolymers are compact and solid.
- The pH and conductivity tests and the integrity and weight tests demonstrated the stability of the materials.
- The FT-IR study and boiling water test confirmed the successful geopolymerization in all samples.
- The antibacterial assay and durability test showed the antibacterial activity and gave a first idea about the durability of samples if put into the environment.
- The mechanical tests demonstrate how adding 10 and 20% of WA can improve the material's overall strength.