

M.A. Gómez-Casero *, C. De Dios-Arana*, L. Pérez-Villarejo**, D. Eliche-Quesada*

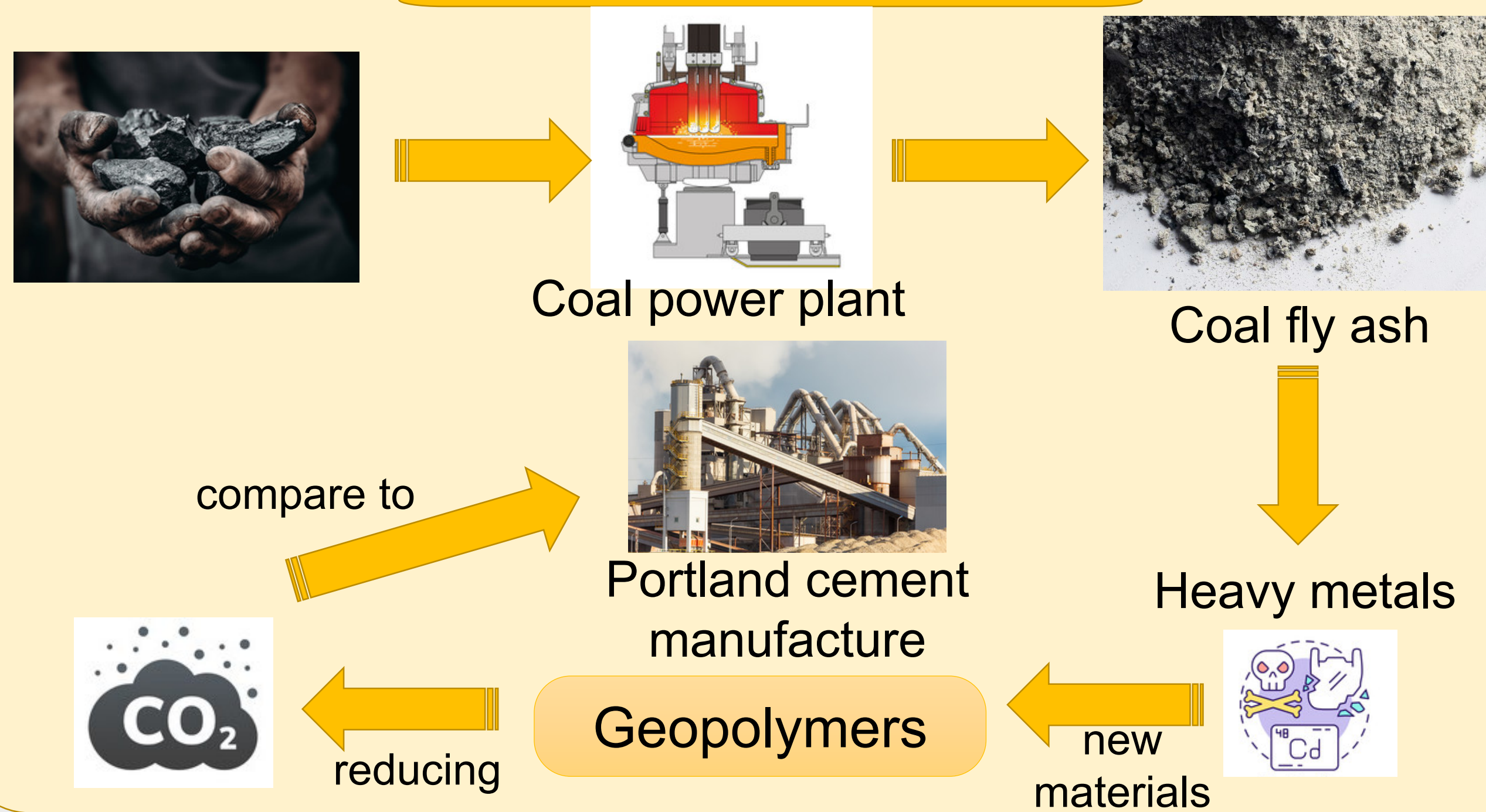
*Department of Chemical, Environmental, and Materials Engineering, Higher Polytechnic School of Jaén, University of Jaén, Campus Las Lagunillas s/n, 23071 Jaén, Spain

**Department of Chemical, Environmental, and Materials Engineering, Higher Polytechnic School of Linares, University of Jaén, Campus Científico-Tecnológico, Cinturón Sur s/n, 23700 Linares (Jaén), Spain

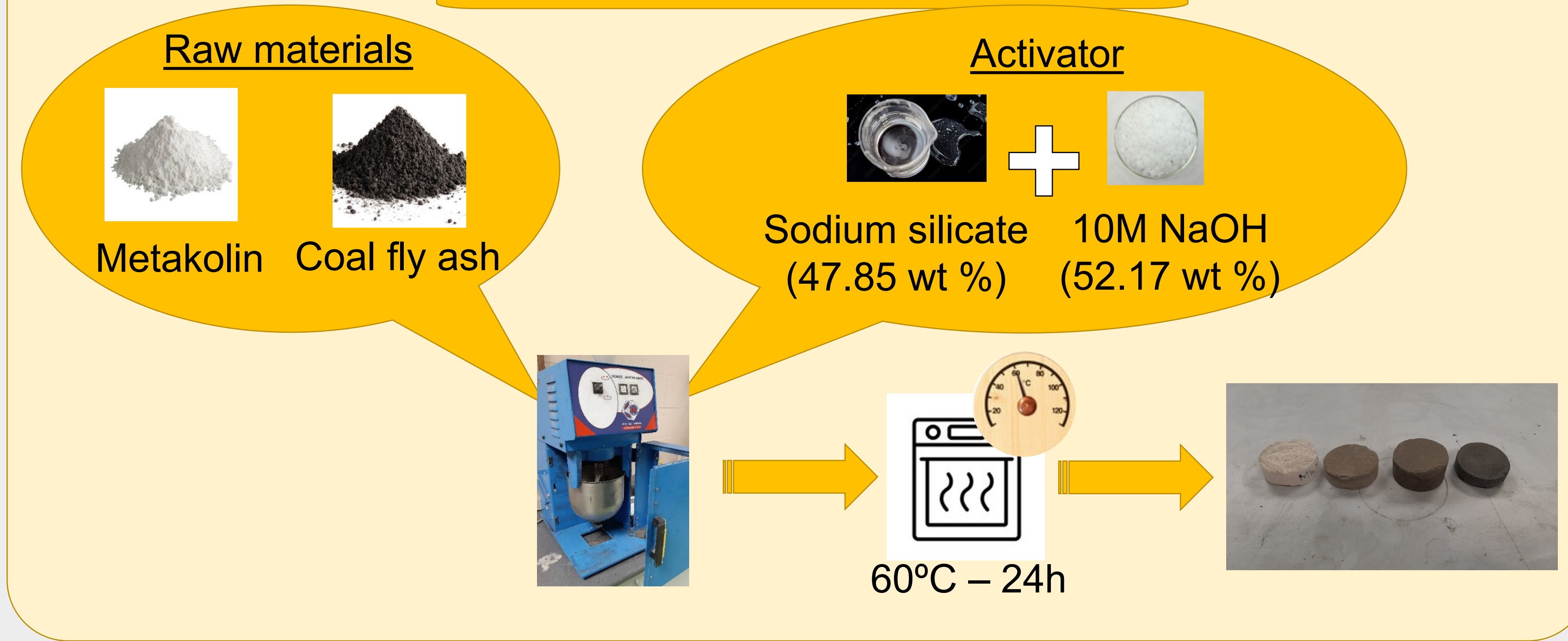
Keywords: geopolymers, metakaolin, coal fly ash, mechanical properties.

Presenting author email: magomez@ujaen.es

Introduction



Materials & Methods



Results & Discussion

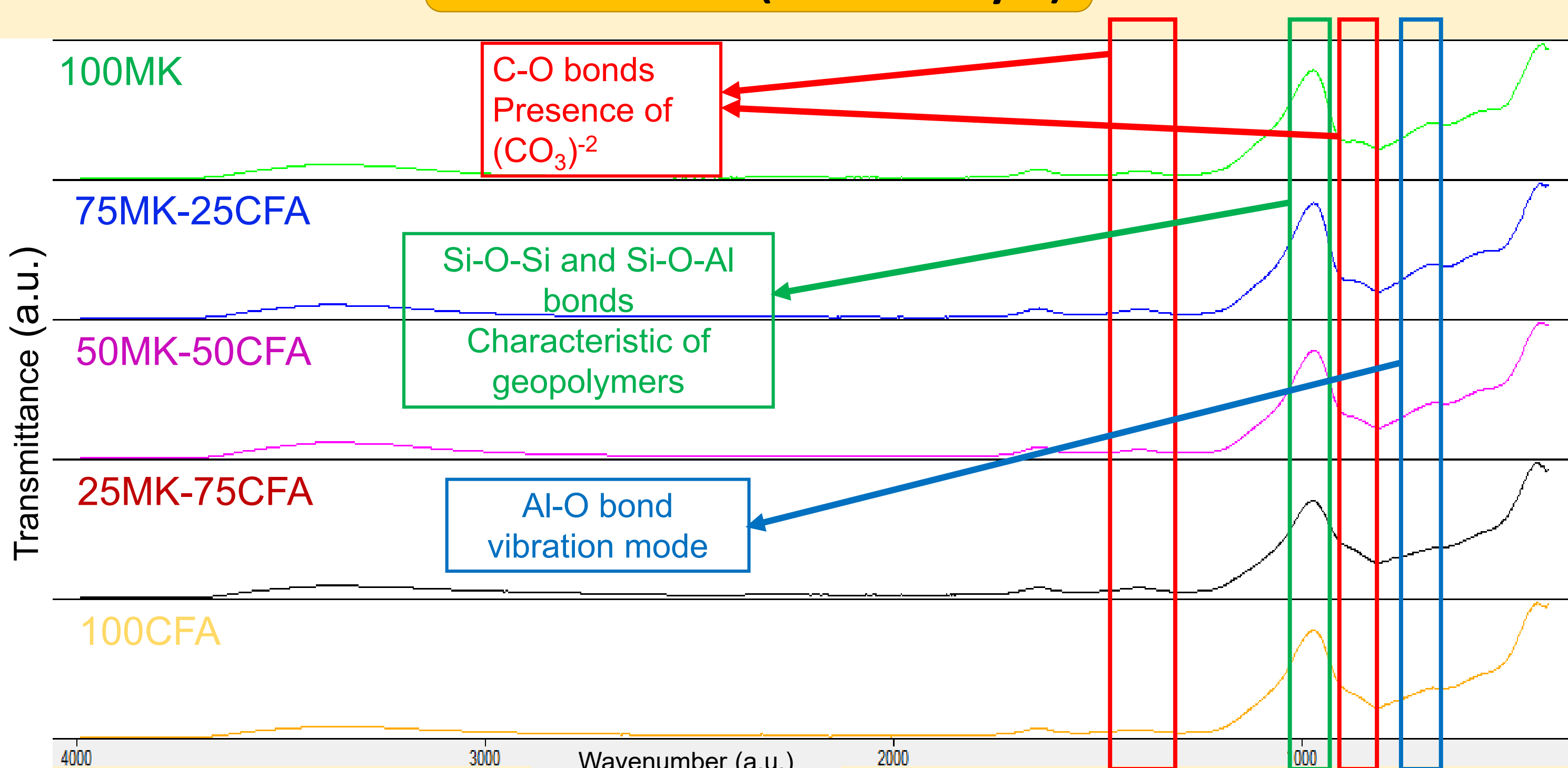
XRF

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	MnO	Na ₂ O	K ₂ O	TiO ₂	P ₂ O ₅	SO ₃	LOI
MK	54.00	43.00	0.48	0.10	0.10	<0.01	0.01	0.50	0.24	0.05	-	0.44
CFA	53.34	21.02	7.20	3.77	1.57	0.05	-	1.87	0.90	0.40	0.82	4.74

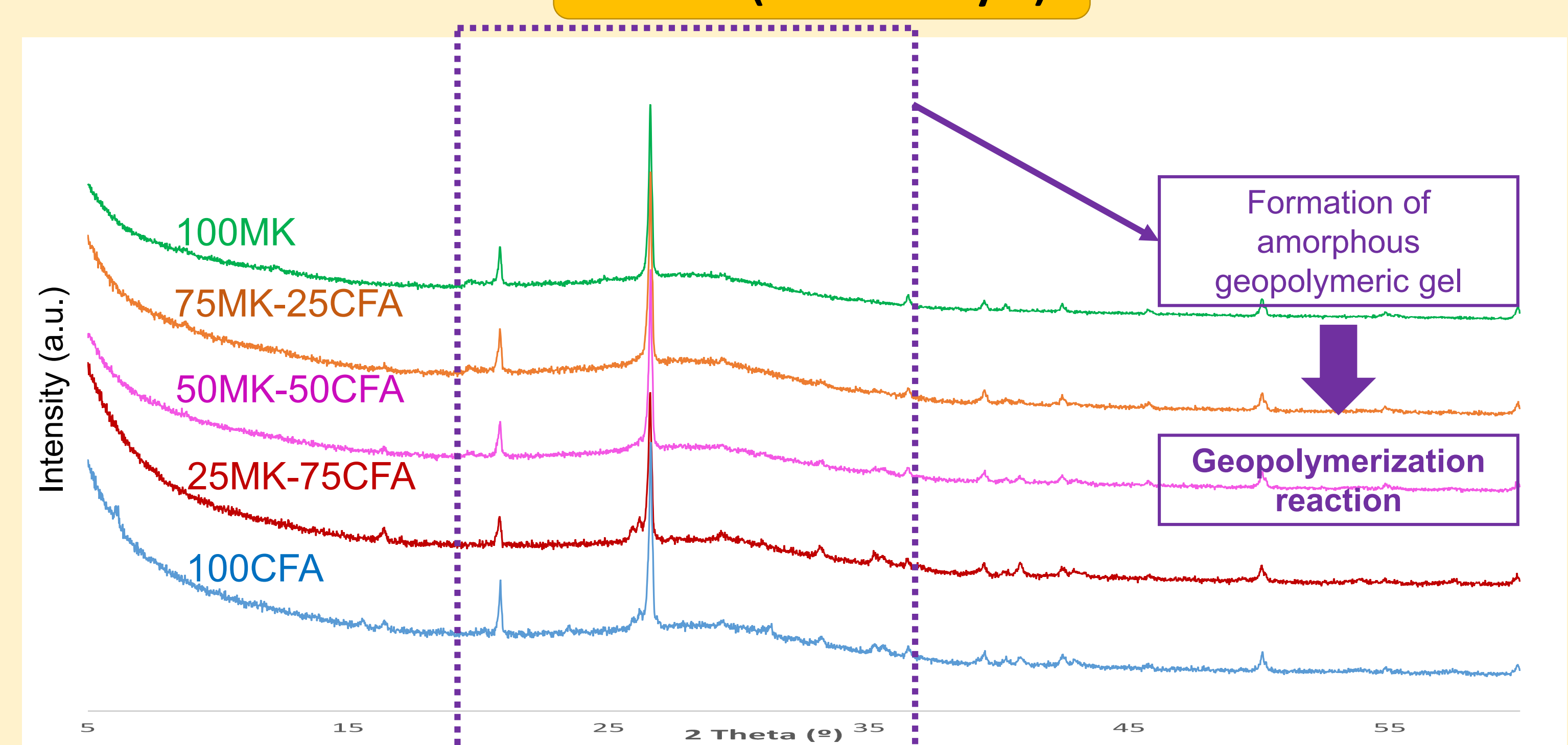
Composition of geopolymers synthesized

Sample	Si/Al molar ratio	Na/Si molar ratio	MK (g)	CFA (g)	Na ₂ SiO ₃ (g)	H ₂ O (g)	NaOH (g)	M (mol/l)
100MK	1.45	0.51	450.0	0	300	195	80	10
75MK-25CFA	1.66	0.51	337.5	112.5	300	195	80	10
50MK-50CFA	1.94	0.52	225.0	225.0	300	195	80	10
25MK-75CFA	2.34	0.53	112.5	337.5	300	195	80	10
100CFA	2.94	0.53	0	450.0	300	195	80	10

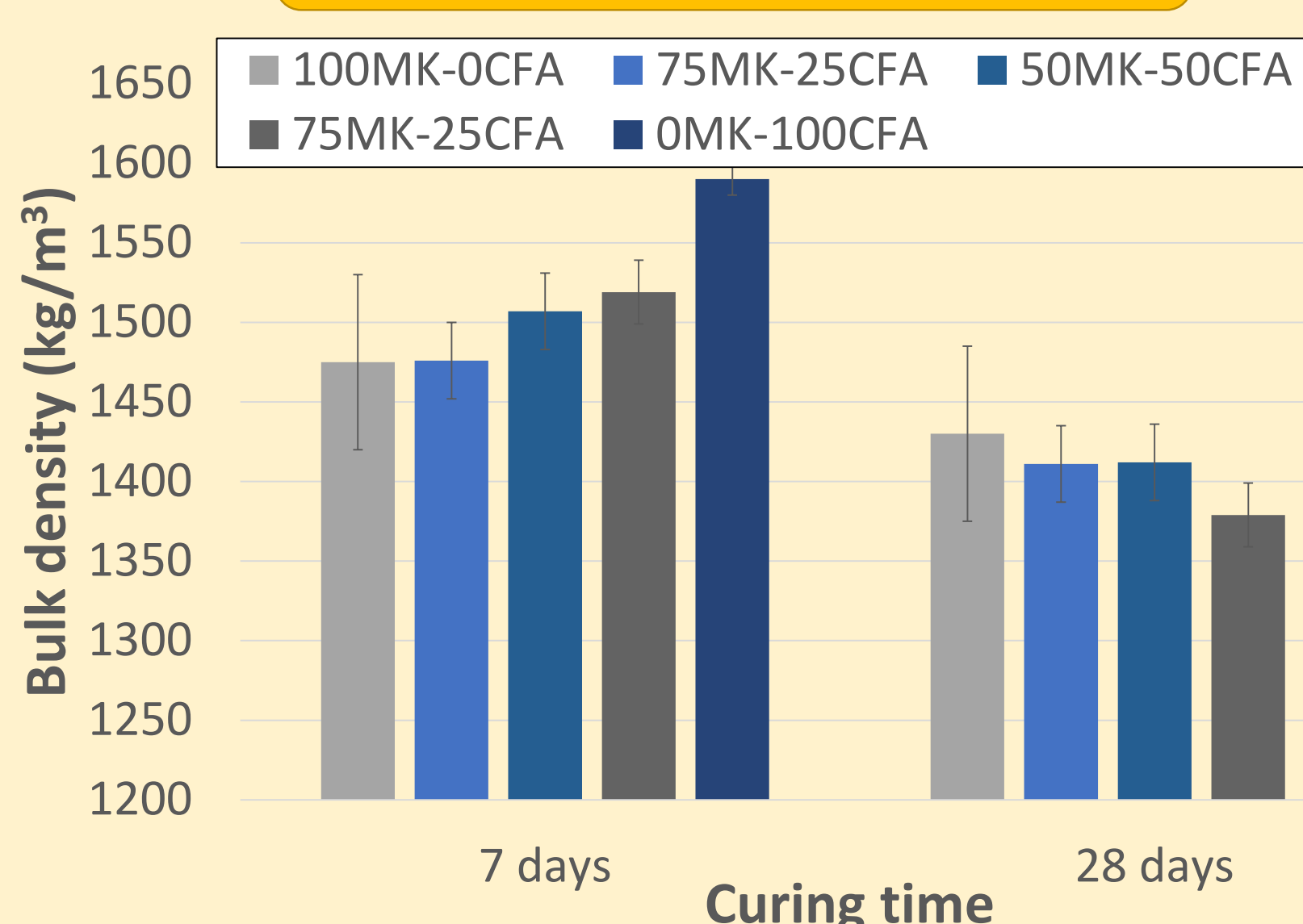
FTIR-ATR (at 7 days)



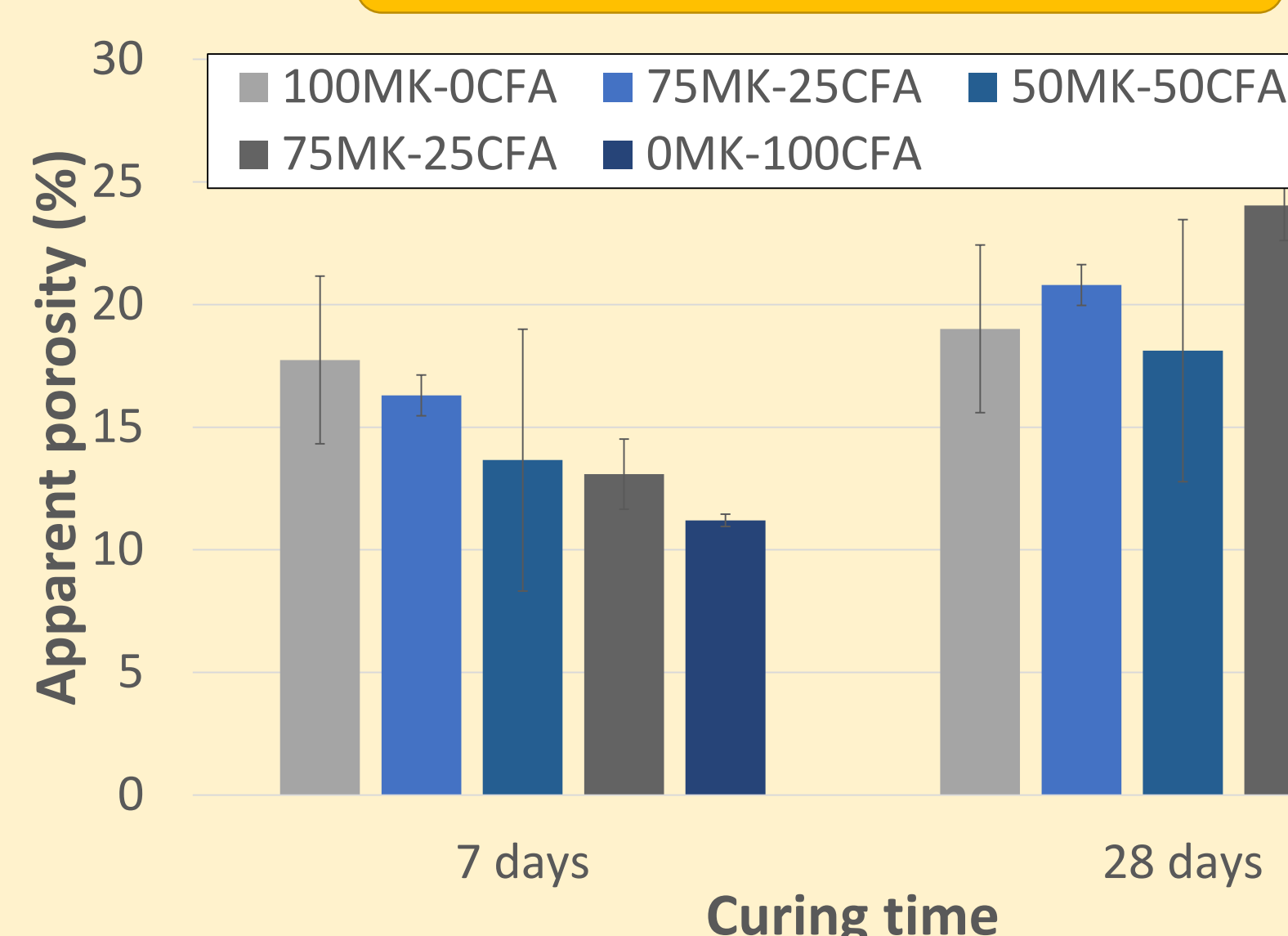
XRD (at 7 days)



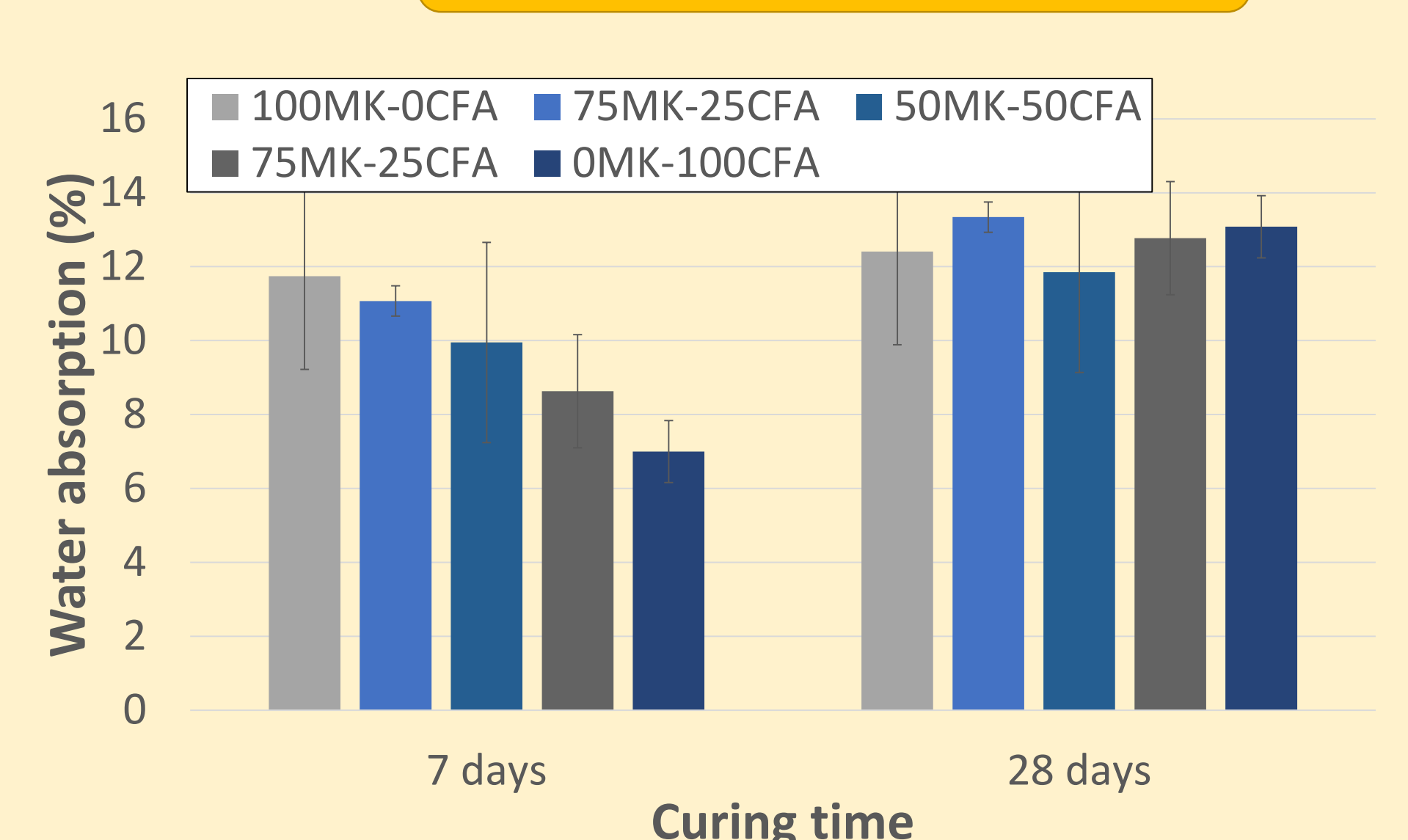
Bulk density



Apparent porosity



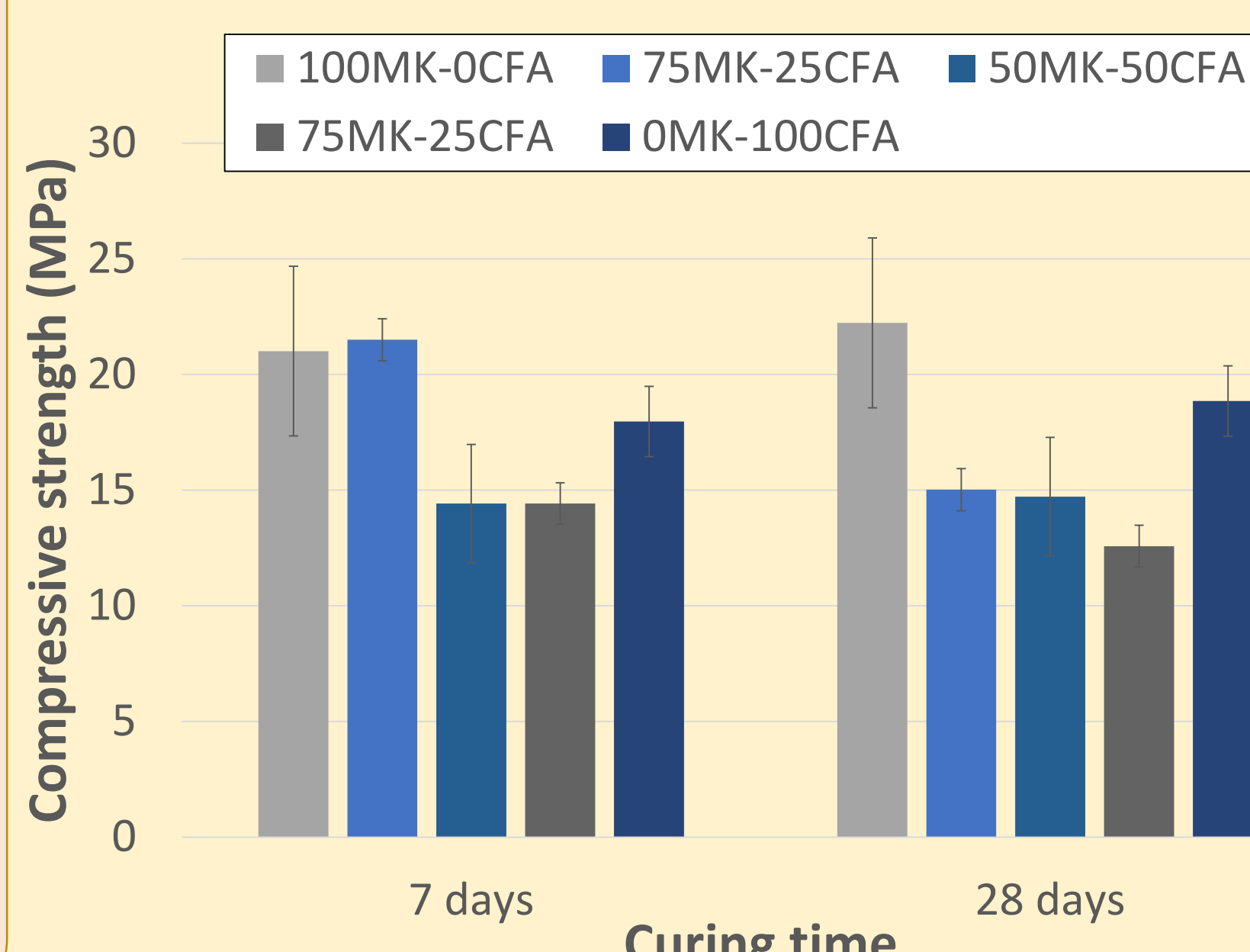
Water absorption



Acknowledgements

This work has been funded by the project *Development and characterization of new geopolymeric composites based on waste from the olive industry. Towards a sustainable construction* (MAT2017-88097-R), FEDER / Ministry of Science, Innovation and Universities, State Research Agency. M.A. Gómez-Casero acknowledges support of MINECO (PRE2018-084073). The authors thank "Caobar S.A." company and "Central térmica Litoral de Almería" for supplying the kaolinite and coal fly ash, respectively. Technical and human support provided by CICT of Universidad de Jaén (UJA, MINECO, Junta de Andalucía, FEDER) is gratefully acknowledged

Compressive strength



Conclusions

- C-S-H geopolymeric gel is formed for all MK-CFA proportions. But more CFA content, less gel formed.
- Geopolymer process has concluded after 7 days.
- Incorporation of CFA produces a slight decrease of mechanical properties. Except when is used alone.
- Better physical properties are measured when 50MK-50CFA is synthesized.
- The results indicate that the replacement of the CFA residue by MK can be an alternative to conventional Portland cement.