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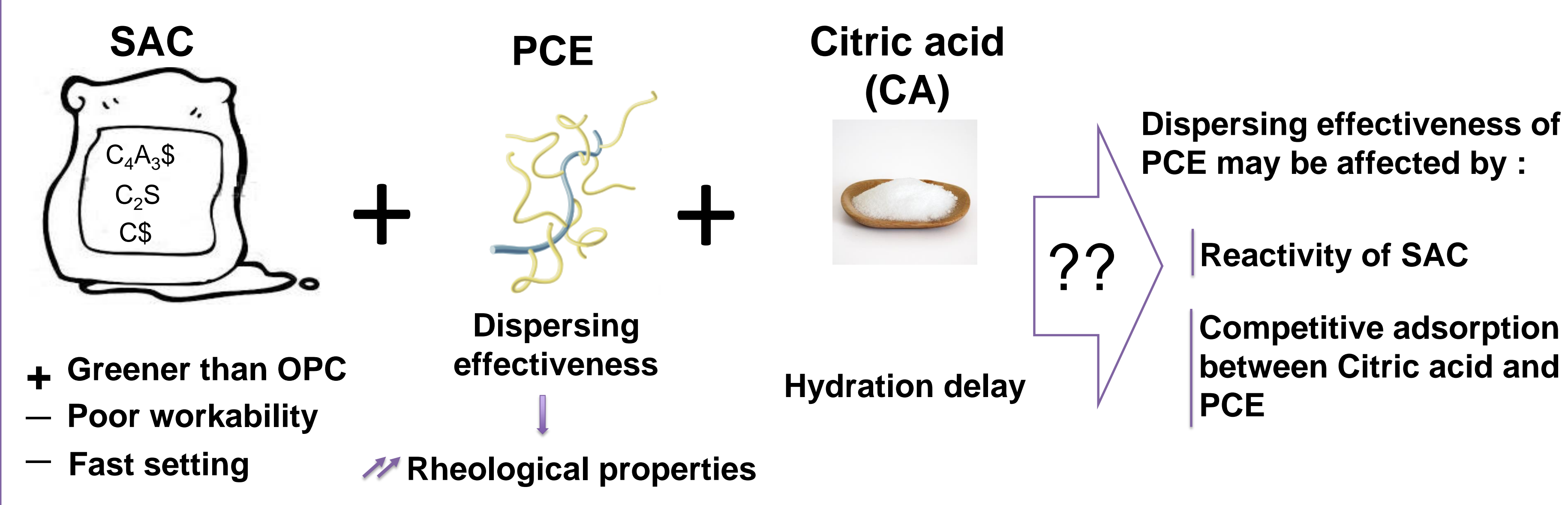
Hydration and rheology of sulfoaluminate-belite cements (SAC) in presence of polycarboxylate superplasticizers (PCE) and citric acid

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1. Context

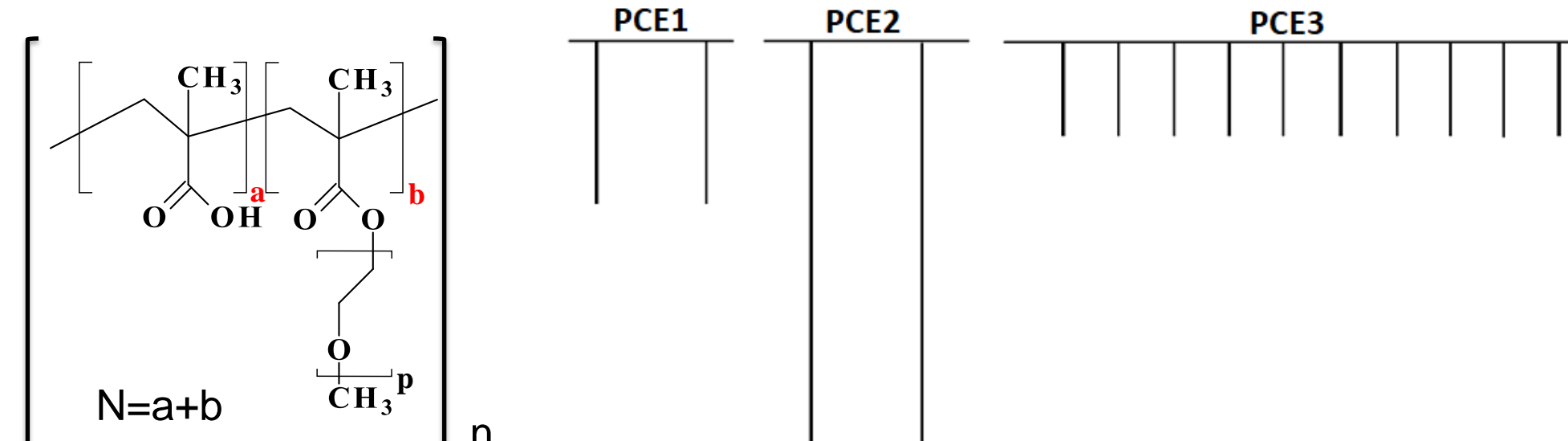


3. Materials

- Commercial SAC (i.tech ALI CEM)
- Citric acid (99,5% Honeywell)
- 3 polycarboxylates ethers (PCE1, PCE2 and PCE3)

Phase composition of SAC (%)	C ₄ A ₃ \$	C ₂ S	C\$
	49,3	15,1	23,5

	Mw (g/mol)	Charge density (mmol/g)	P	N	n
PCE1	48300	0,79	45	5	12
PCE2	138600	0,3	114	5	15
PCE3	11900	0,96	17	2,5	115

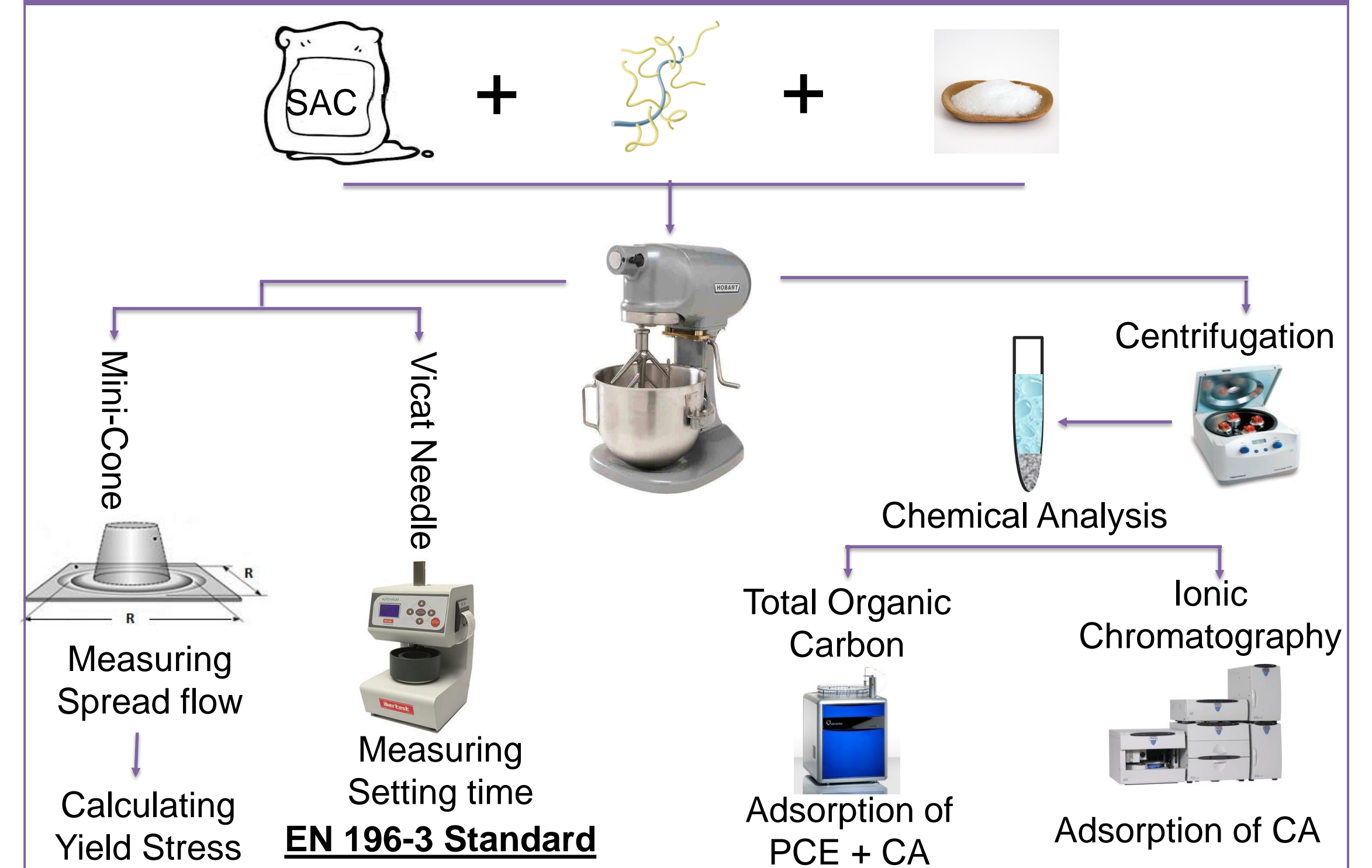


2. Objectives

Understand the :

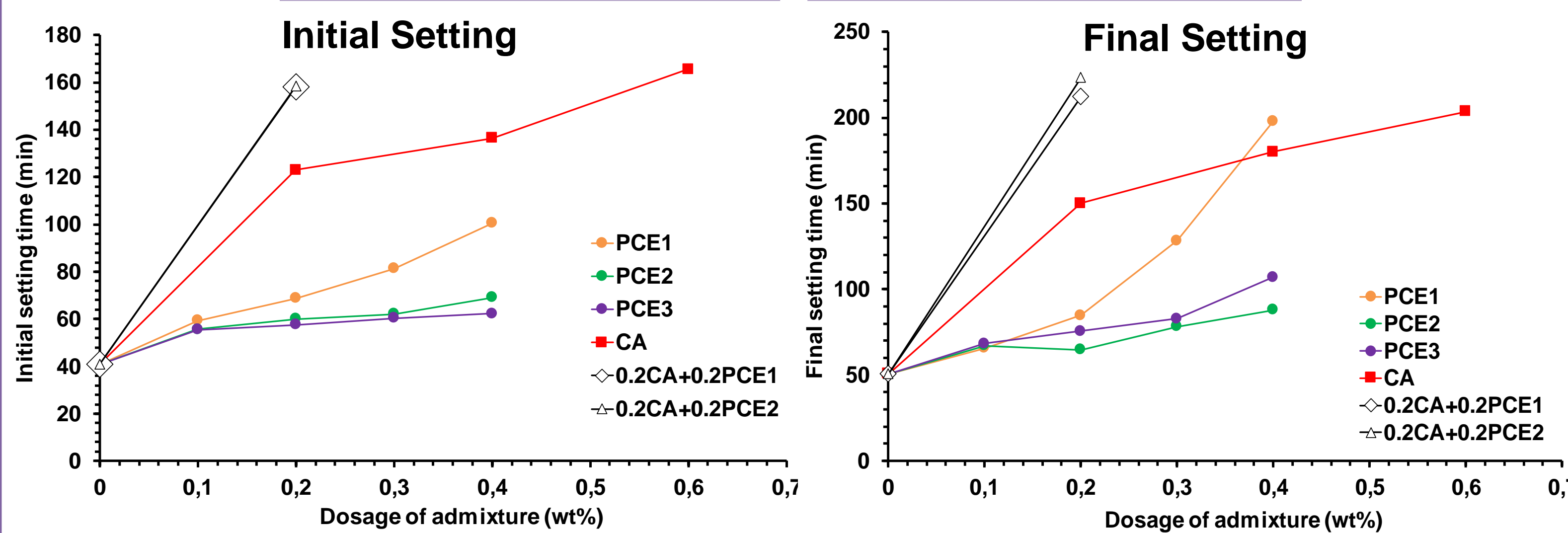
- Effect of the chemical structure of PCE on the hydration and rheology of reactive SAC
- Effect of combination of citric acid with PCE on hydration and rheology of reactive SAC

4. Methods

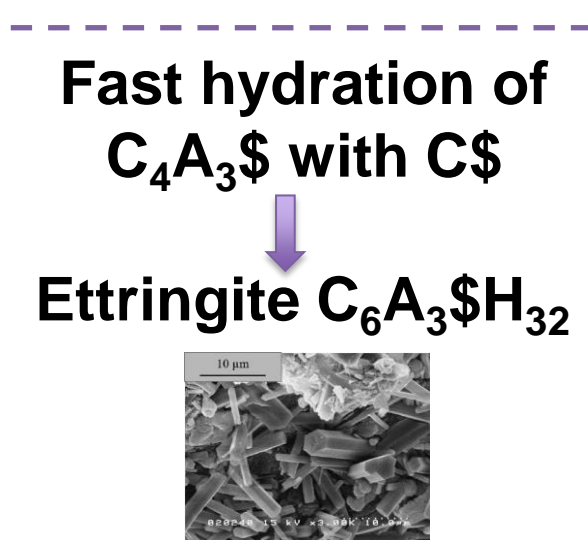


5. Results

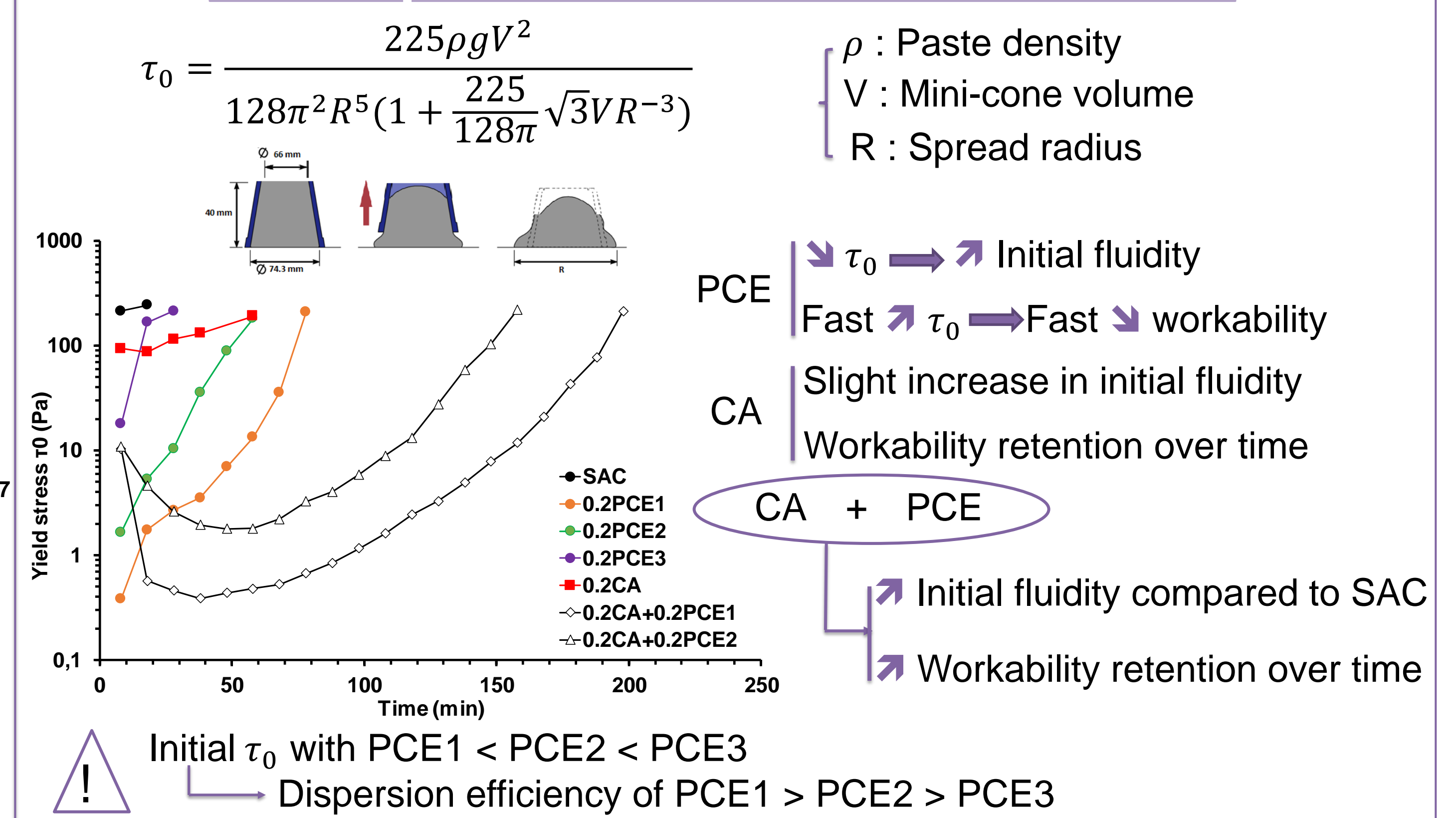
Setting-Time



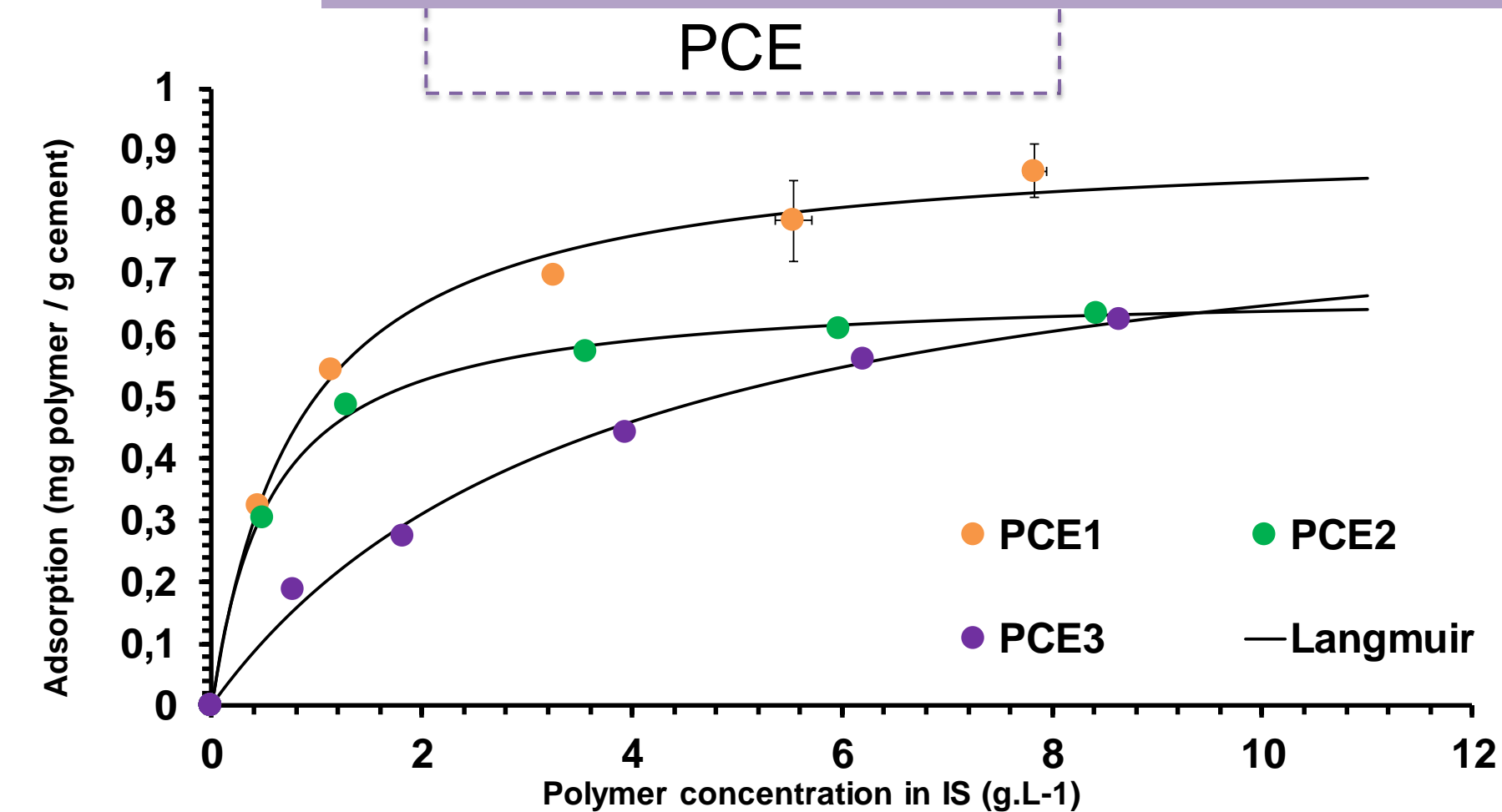
- Short setting time of SAC without admixtures
- CA delays significantly the Initial and Final setting times
- % in PCE → Initial & Final setting: PCE1 > PCE2 ≈ PCE3
- PCE + CA → Initial & Final setting: PCE+CA > CA > PCE
- PCE1 + CA ≈ PCE2 + CA



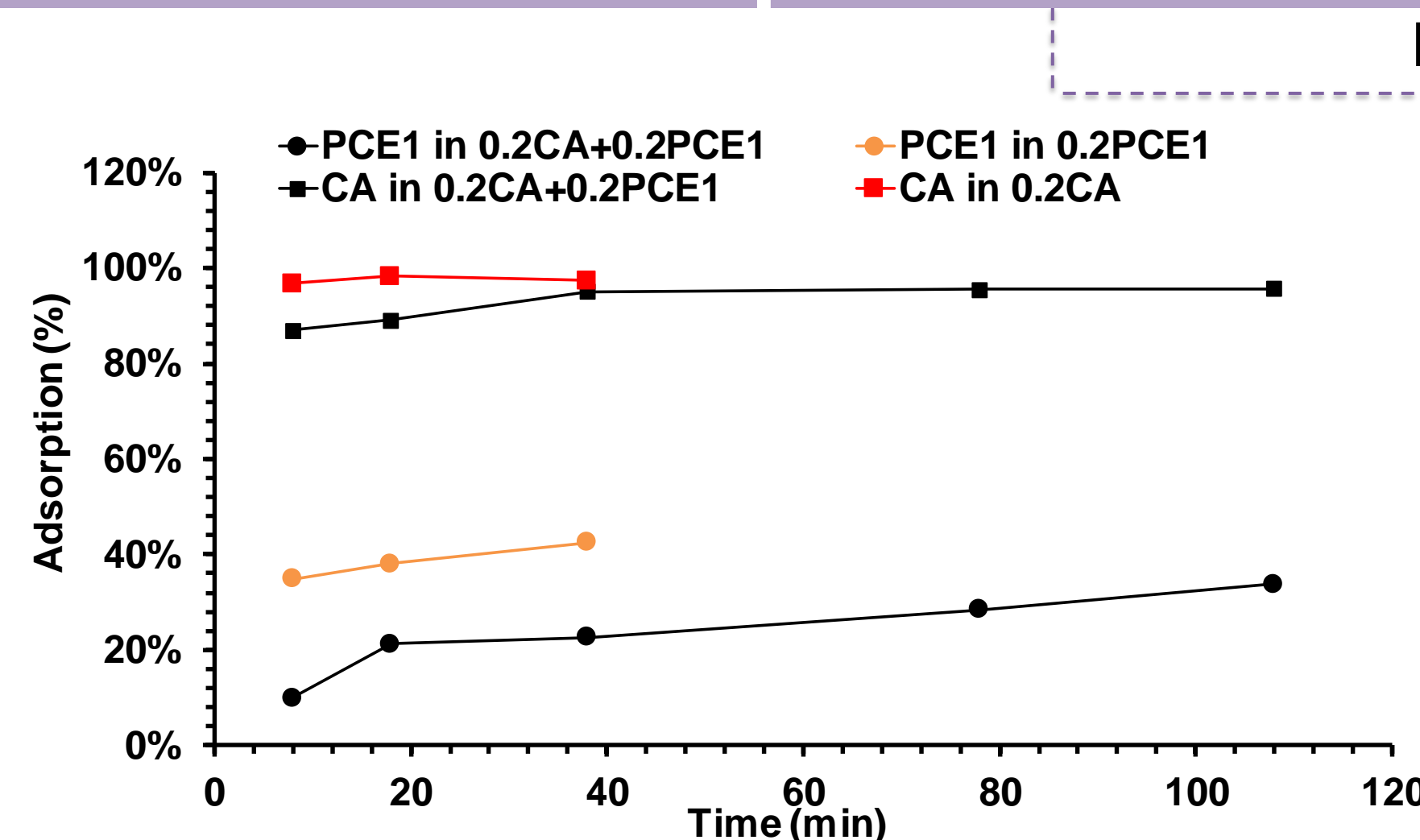
Spread flow / Yield stress



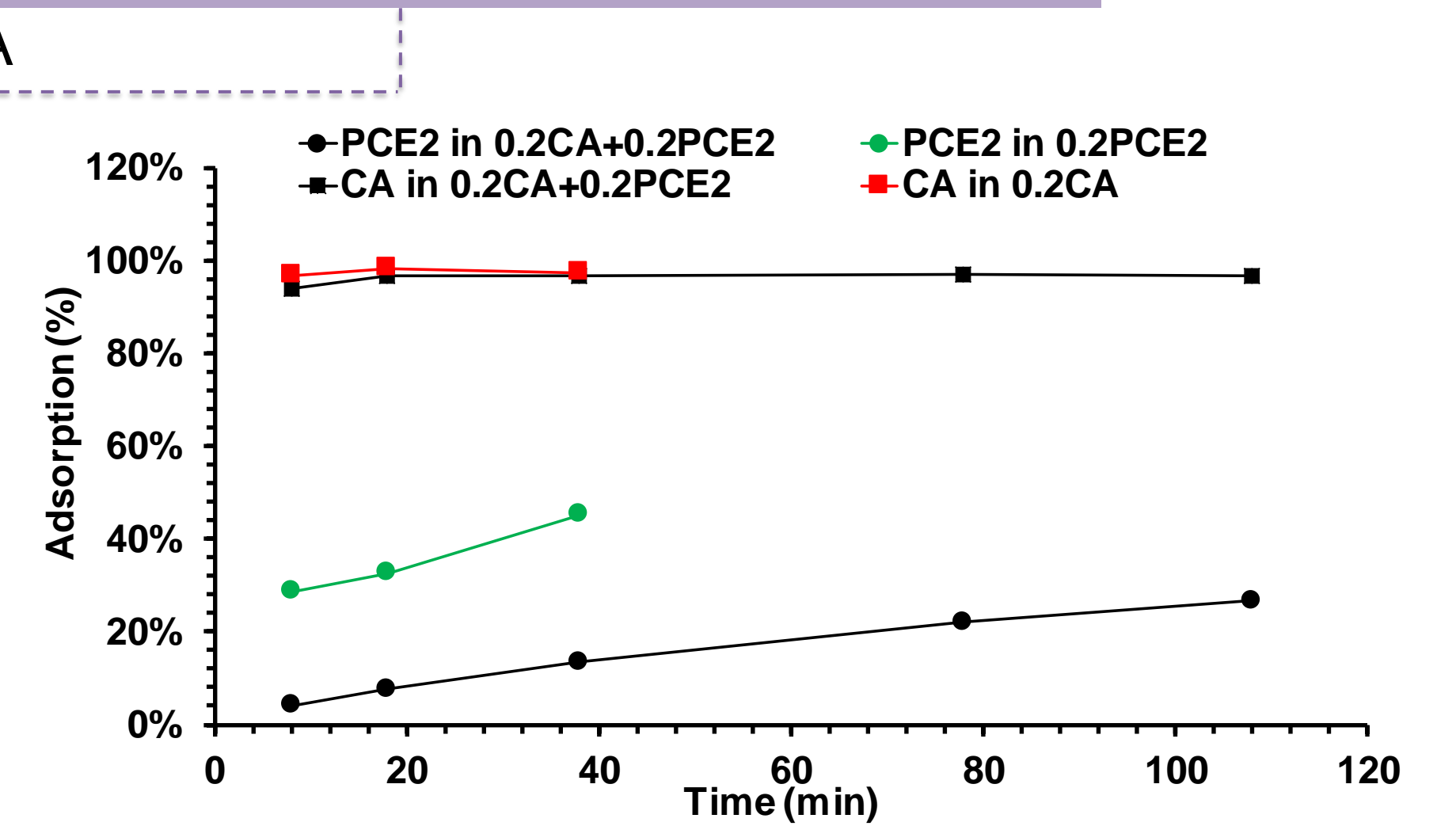
Adsorption



Explain the better dispersing efficiency of PCE1 and the lowest dispersing efficiency of PCE3



Competitive adsorption



Competitive adsorption

6. Conclusions & Perspectives

PCE
Setting time: PCE1 > PCE2 ≥ PCE3
Dispersing effectiveness: PCE1 > PCE2 > PCE3
Adsorption: PCE1 > PCE2 > PCE3

CA
Setting time: CA > PCE
Adsorption: CA > 97% >> PCE

CA + PCE
Setting time: PCE + CA > CA > PCE
Adsorption: CA > 87% > PCE & PCE < PCE alone
Effect: Initial fluidity compared to PCE alone, Workability retention over time

TGA & DRX are required to follow the hydration

Rheological properties

The amount of PCE consumed by intercalation

CA reduces the amount of ettringite at early age

Hypothesis