



**HAL**  
open science

# Effets des superplastifiants de types polycarboxylates et de l'acide citrique sur l'hydratation et la rhéologie des ciments sulfoalumineux-bélitique

Rachid Belhadi, Alexandre Govin, Philippe Grosseau

## ► To cite this version:

Rachid Belhadi, Alexandre Govin, Philippe Grosseau. Effets des superplastifiants de types polycarboxylates et de l'acide citrique sur l'hydratation et la rhéologie des ciments sulfoalumineux-bélitique. Journée Scientifique 2018 du Codegepra, Nov 2018, Saint-Etienne, France. , Journée scientifique du CODEGEPRA - Le Génie des Procédés en Rhône-Alpes Auvergne, pp.25 / P15. hal-01991878

**HAL Id: hal-01991878**

**<https://hal.science/hal-01991878v1>**

Submitted on 24 Jan 2019

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

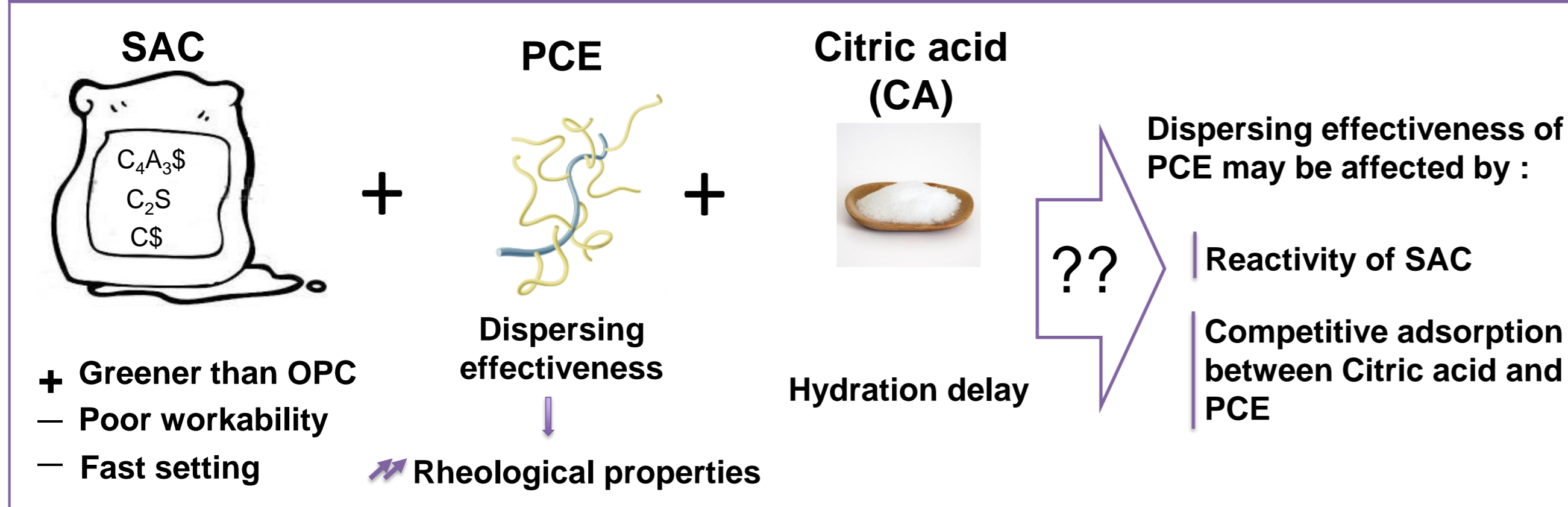
# Hydration and rheology of sulfoaluminate-belite cements (SAC) in presence of polycarboxylate superplasticizers (PCE) and citric acid

R. Belhadi\*, A. Govin & P. Grosseau

Mines Saint-Etienne, Univ Lyon, CNRS UMR 5307 LGF, Centre SPIN, Departement PMMG, F - 42023 Saint-Etienne France

\* rachid.belhadi@emse.fr

## 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 (%)	$C_4A_3S$	$C_2S$	$C\$$
	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

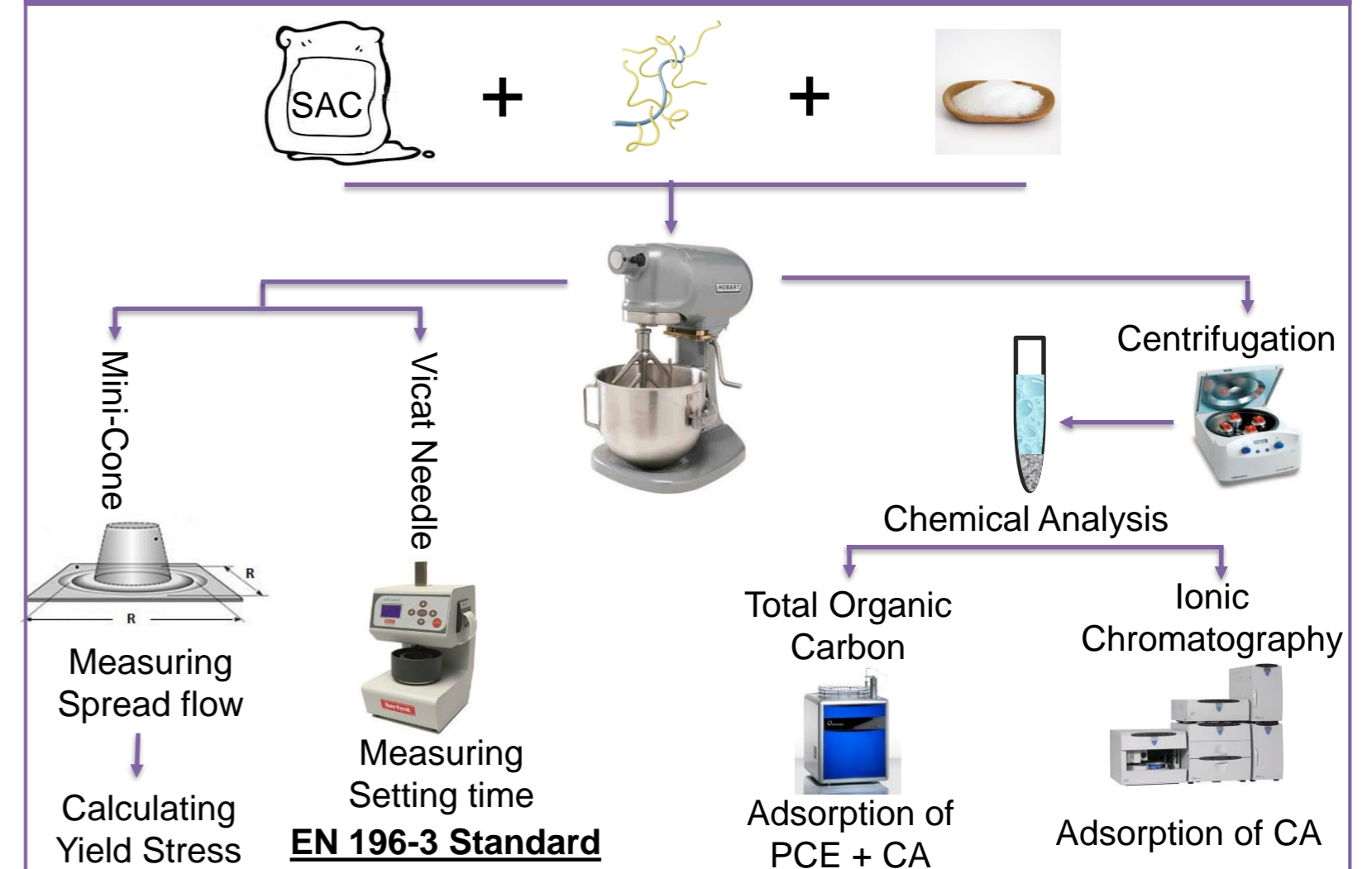
Chemical structure of PCE:  $N=a+b$ ,  $n$

## 2. Objectives

Understand the:

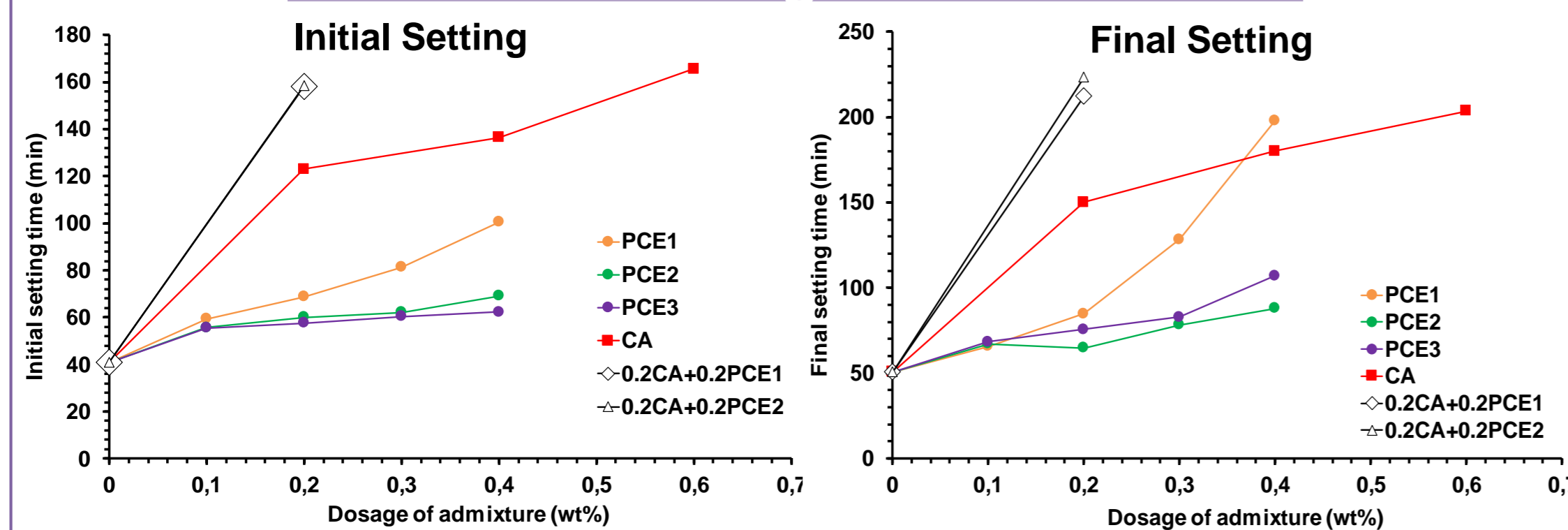
- Effect of the chemical structure of PCE on the hydration and rheology of reactive SAC
- Effect of combination of citric acid with PCE on hydration and rheology of reactive SAC

## 4. Methods



## 5. Results

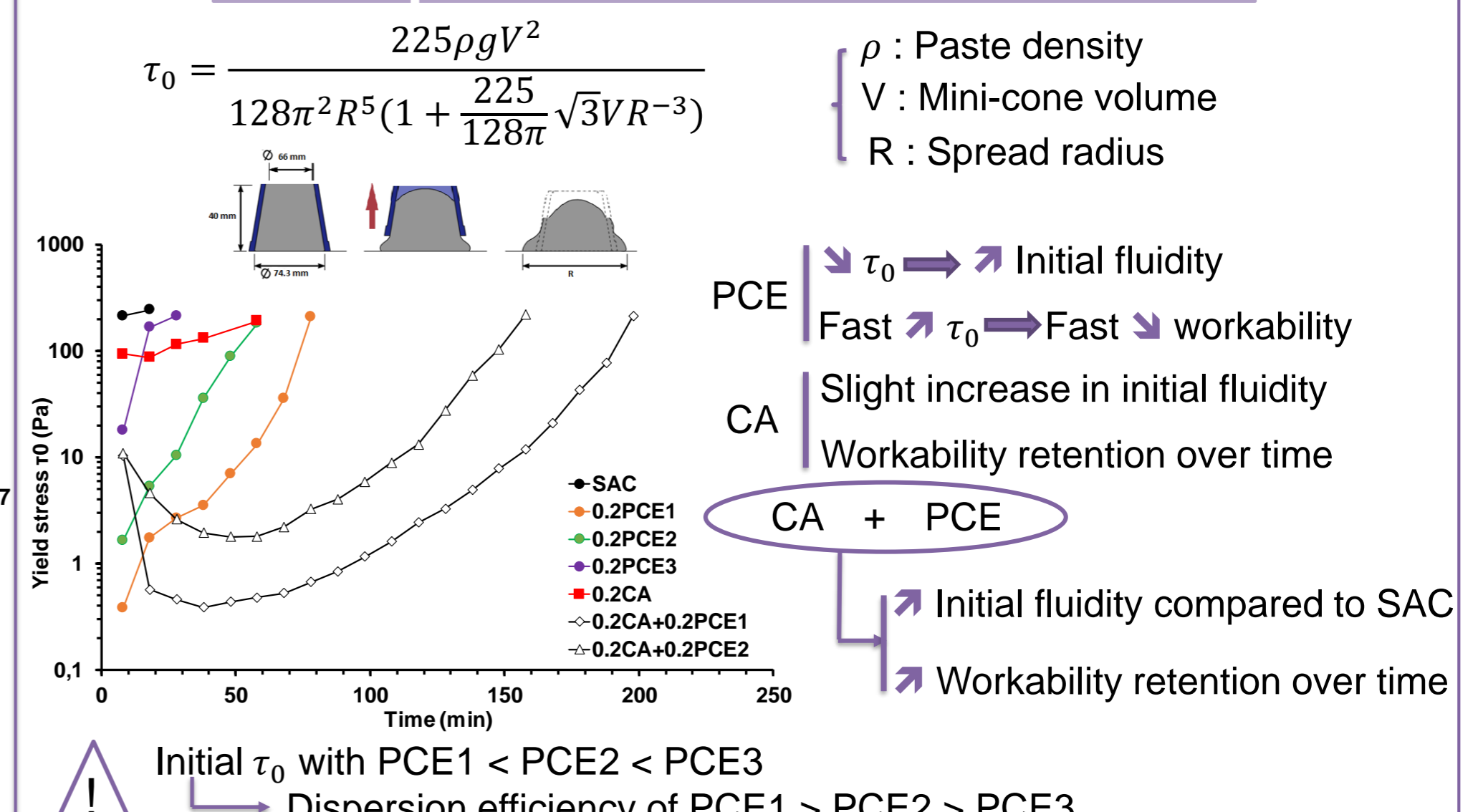
### Setting-Time



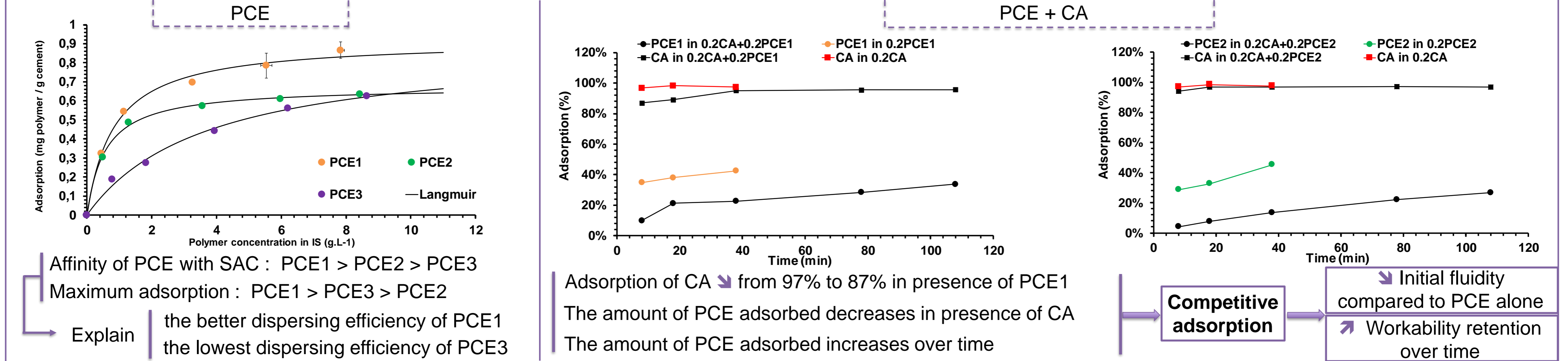
- Short setting time of SAC without admixtures
- CA delays significantly the Initial and Final setting times
- % in PCE  $\rightarrow$  Initial & Final setting: PCE1 > PCE2  $\approx$  PCE3
- PCE + CA  $\rightarrow$  Initial & Final setting: PCE+CA > CA > PCE
- PCE1 + CA  $\approx$  PCE2 + CA

Fast hydration of  $C_4A_3S$  with  $C\$$   
 $\rightarrow$  Ettringite  $C_6A_3SH_{32}$

### Spread flow / Yield stress



### Adsorption



## 6. Conclusions & Perspectives

