Pozzolanic Activity Assessment of Fly Ashes (Argos USA) Anna Maria Workshop XII

2011/11/09

Argos I&D

Daniel Duque

Carlos A. Orozco

ARGOS

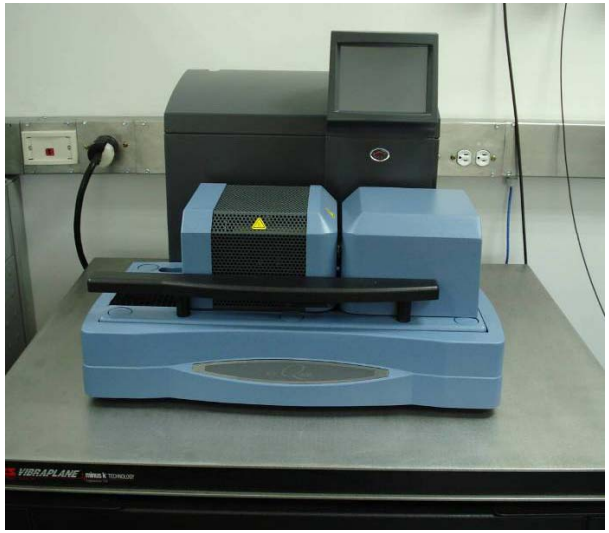
Objectives

- Identify the best parameters to asses fly ashes pozzolanic activity.
  - The evaluation of the pozzolanic activity was carried out using three different techniques:

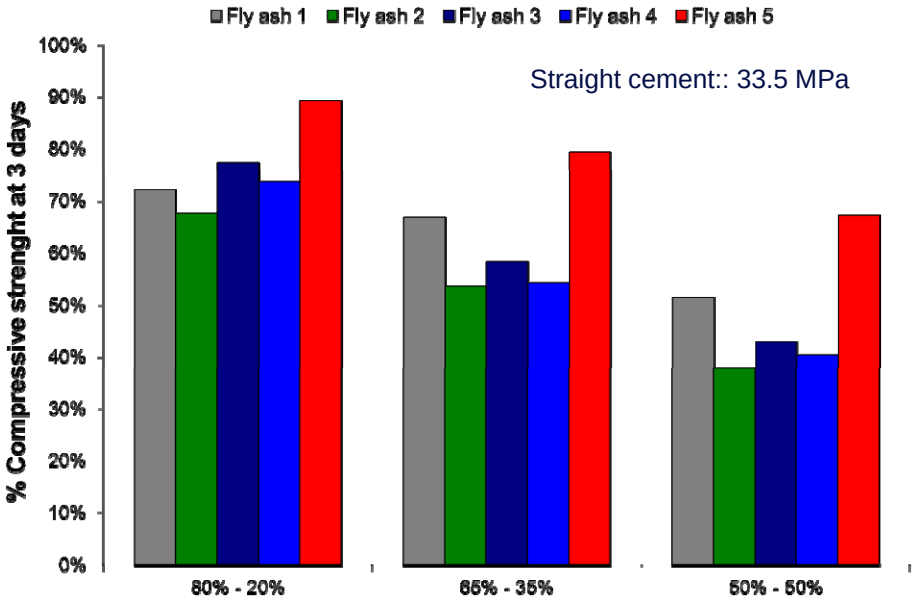
Compressive strength test

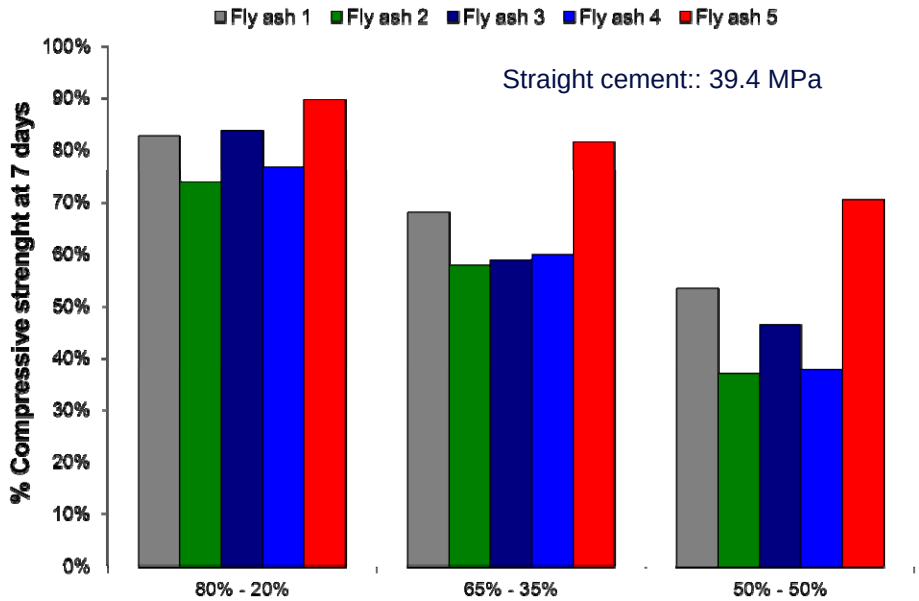
Calorimetry

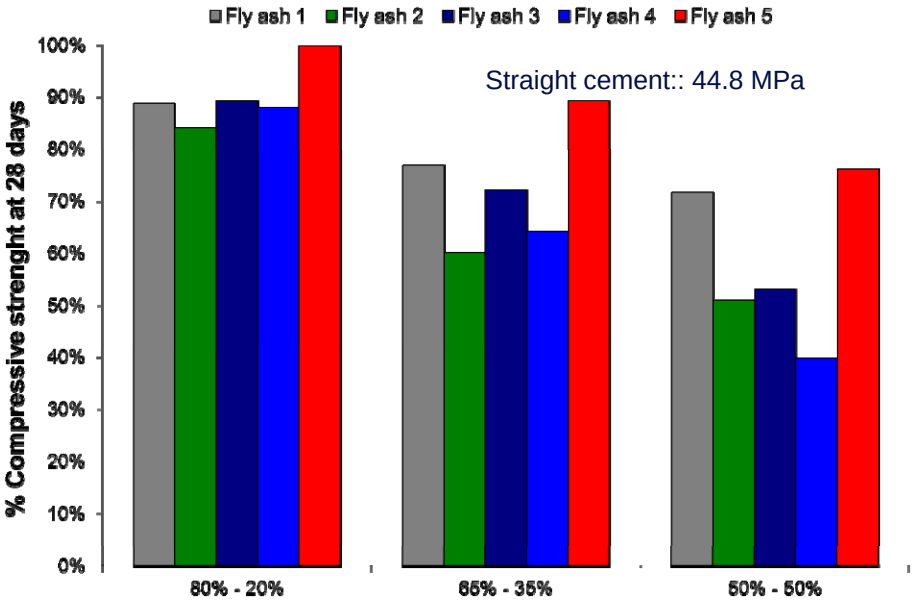
Thermogravimetry



Compressive strength on mortars

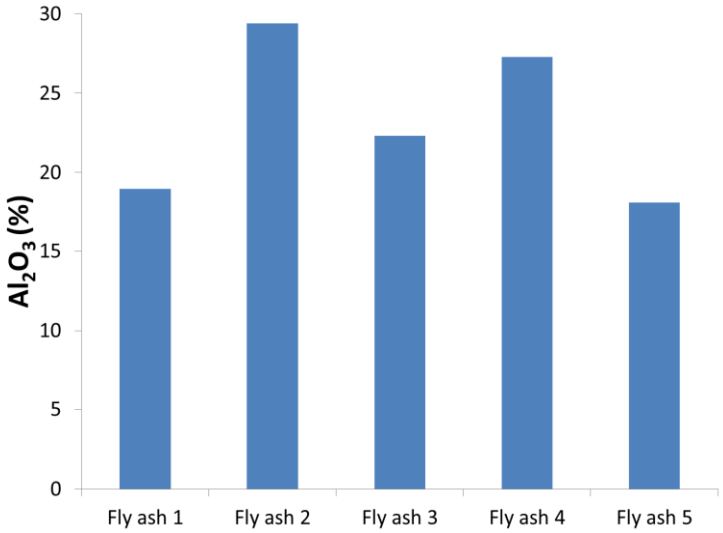


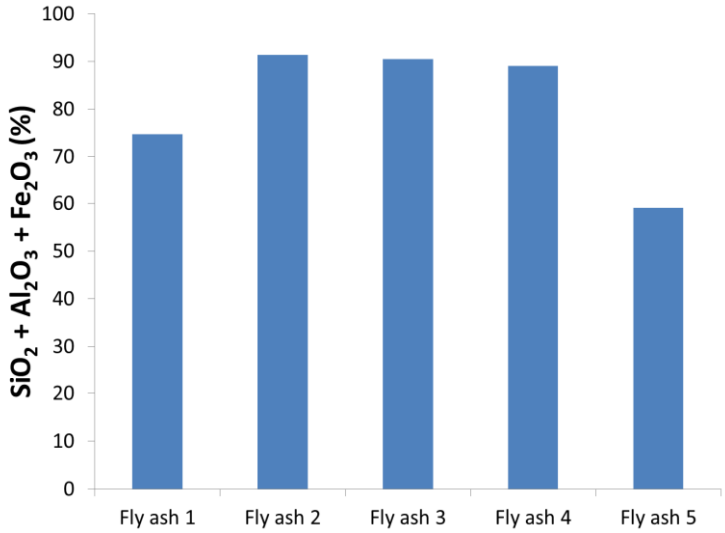


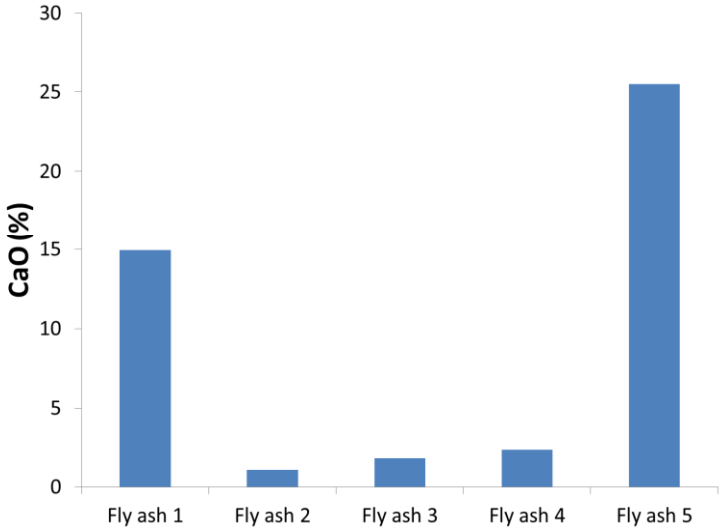


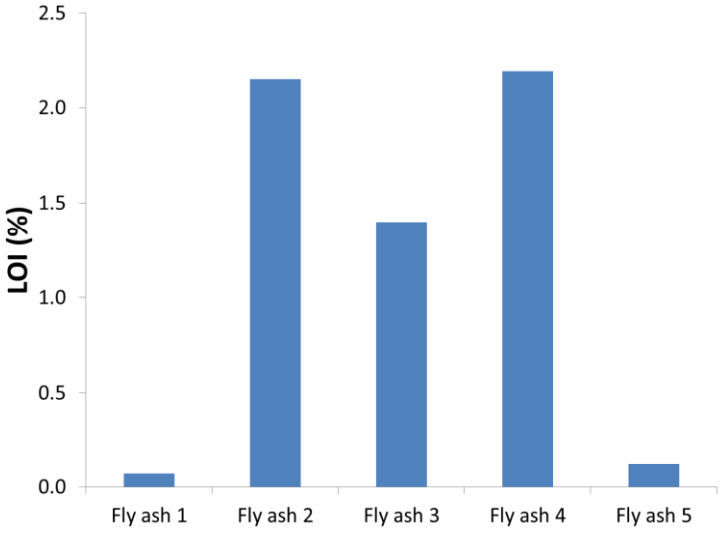
- Top 3:
  - Fly ash 1
  - Fly ash 3
  - Fly ash 5

Materials – Chemical composition



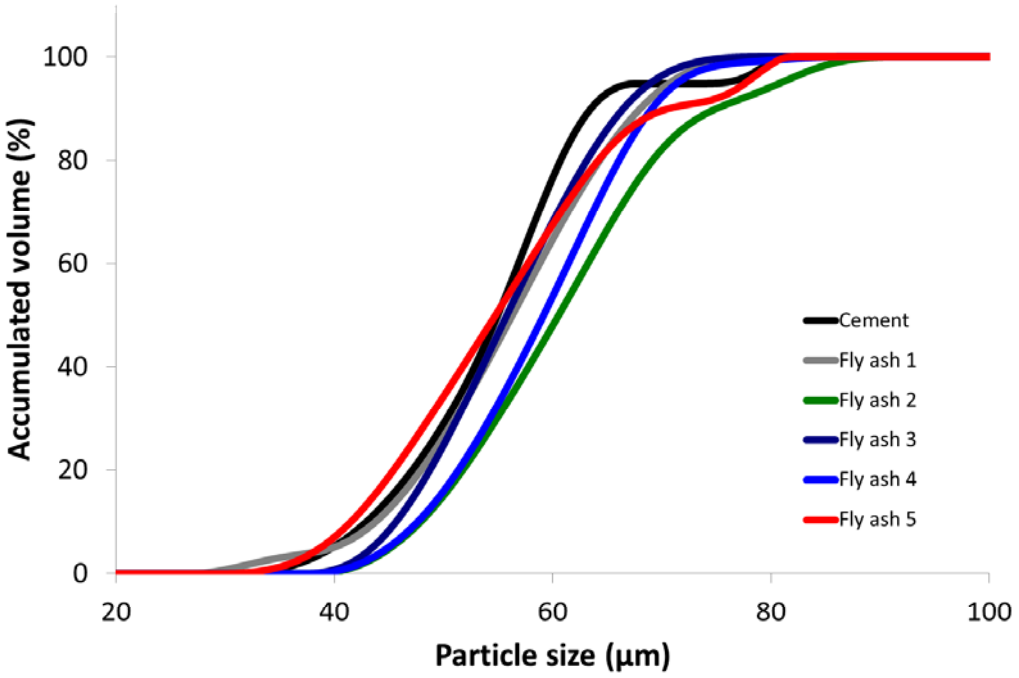






- Cement type I
- Fly ash **1**, 2, **3** and 4: Class F, fly ash **5**: Class C

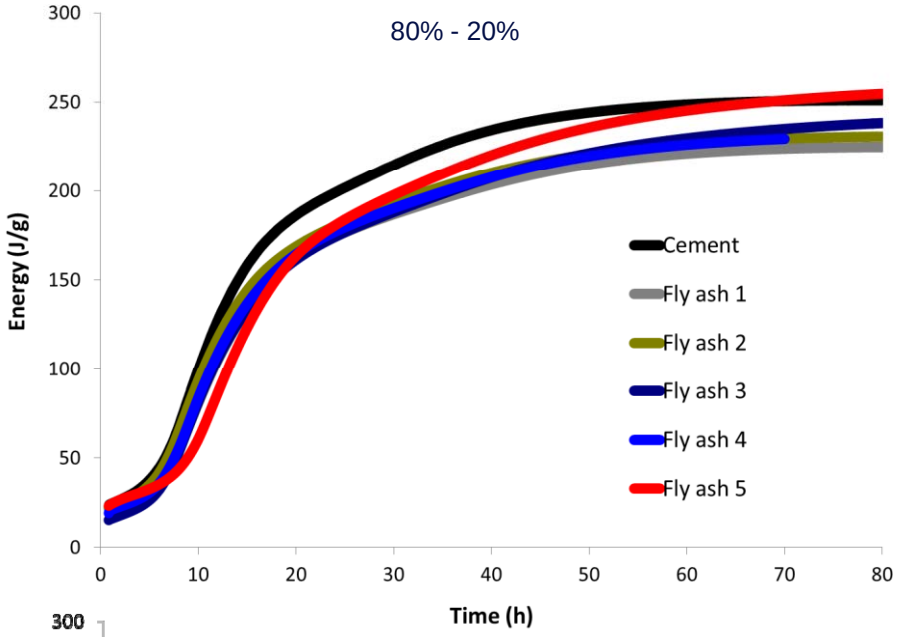
Materials – Physical properties

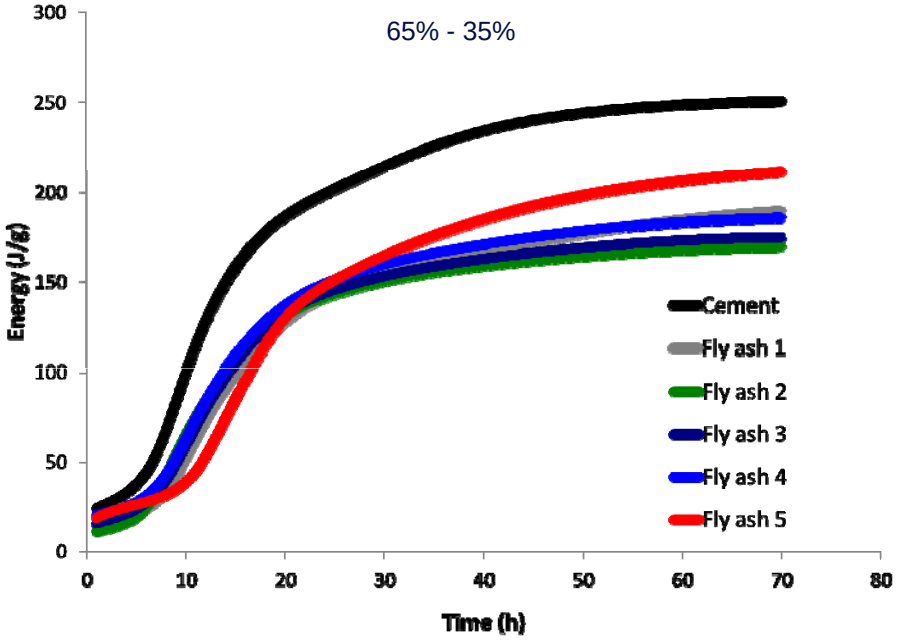


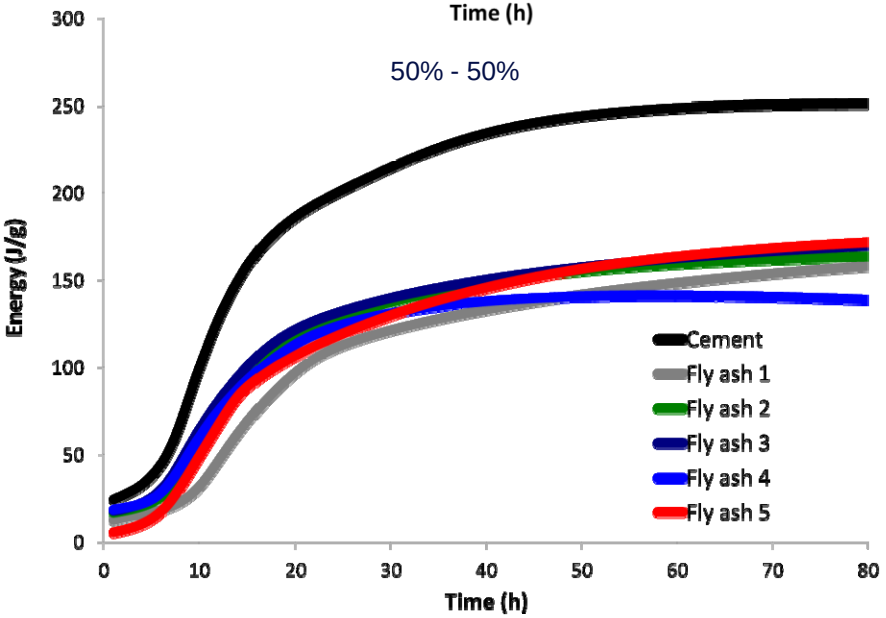
Fly ash	d_{80} (um)	Retained on 325 sieve (%)	Specific surface m^2/g
Cement	32.44	-	0.844
Fly Ash 1	**49.10**	**16.3**	**0.919**
Fly Ash 2	97.10	22.1	0.396
Fly Ash 3	**42.76**	**18.0**	**0.590**
Fly Ash 4	64.76	18.8	0.434
Fly Ash 5	**49.10**	**15.6**	**0.954**

- Fly ashes 1, 3 and 5 have the bigger specific surfaces.

Calorimetry: released heat during hydration

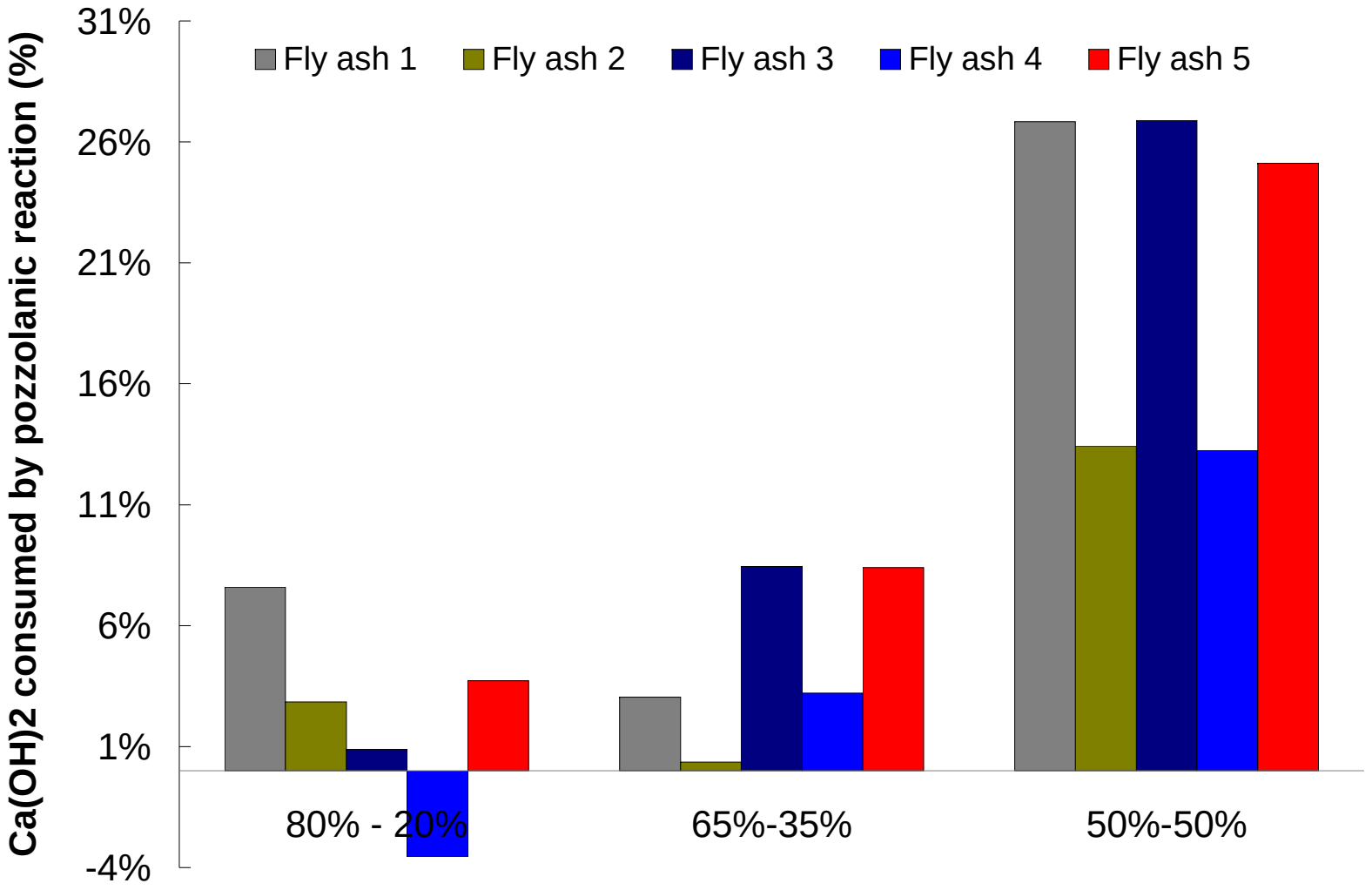






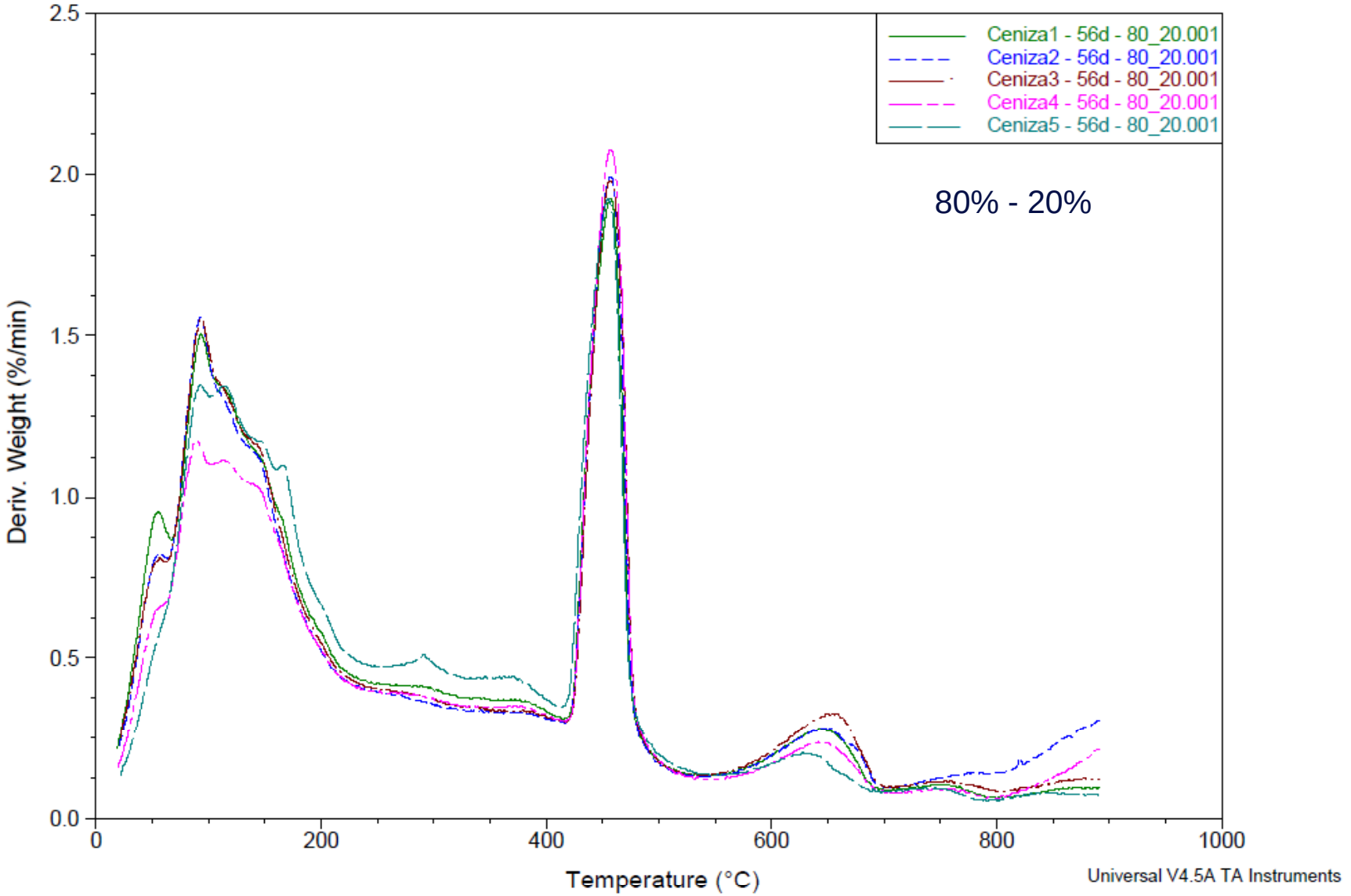
- Fly ash 5 (Class C) released the higher amount of heat for all 3 proportions.
- Almost same behavior for the other 4.

Thermogravimetry: Portlandite consumption and hydrates

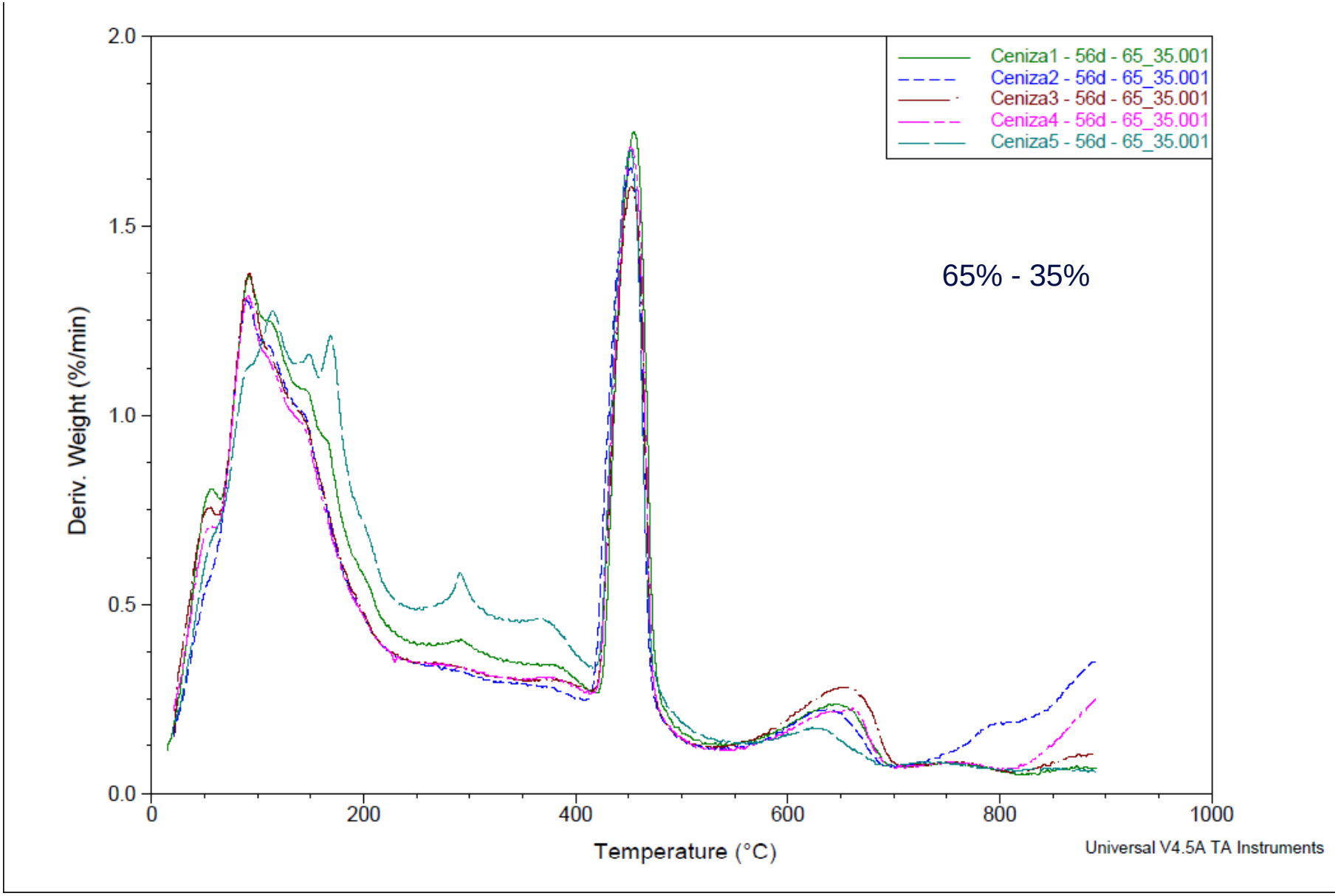


- Fly ashes 1, 3 and 5 present the bigger consumption of Portlandite

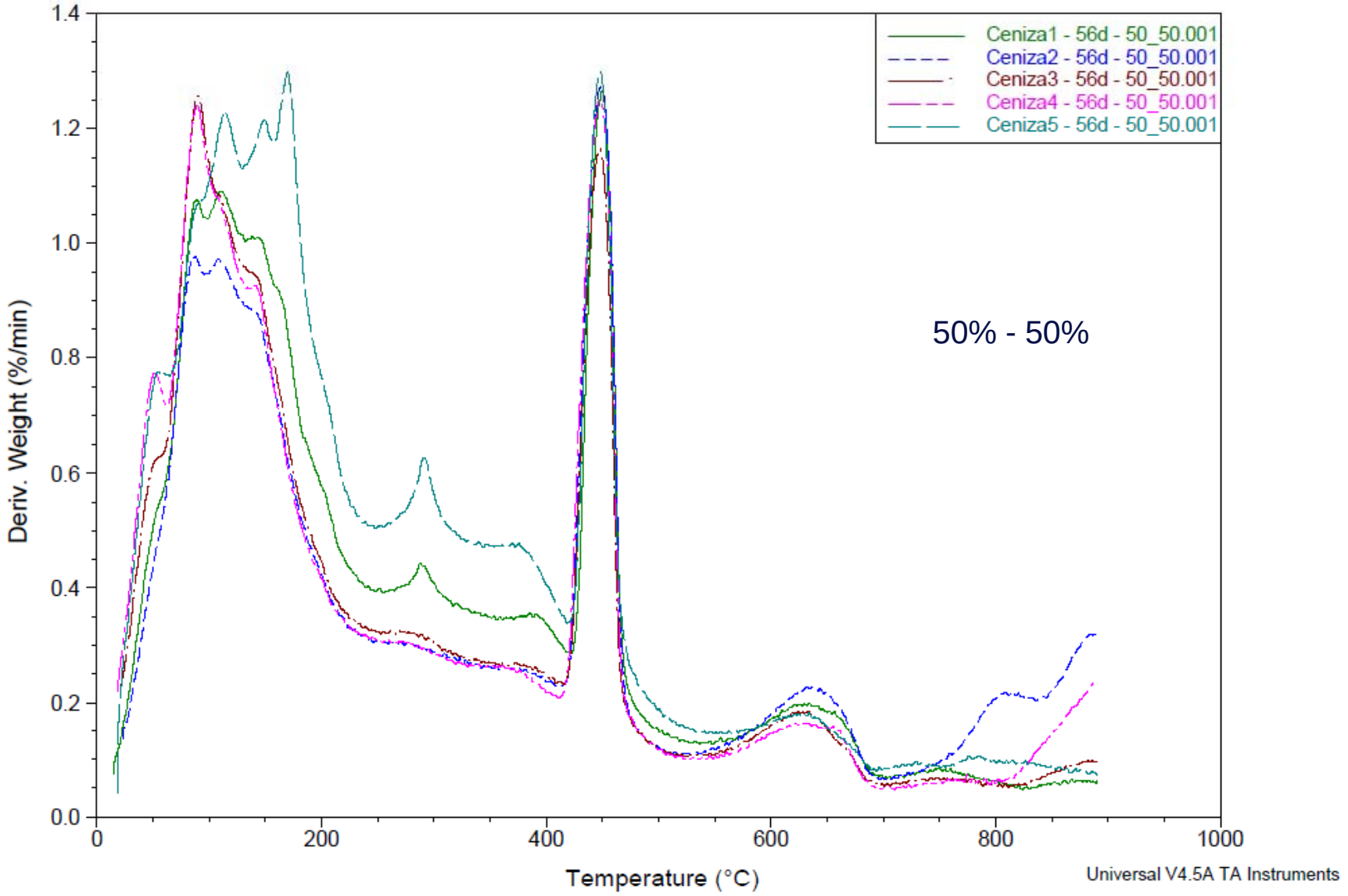
Thermogravimetry: Portlandite consumption and hydrates



Thermogravimetry: Portlandite consumption and hydrates



Thermogravimetry: Portlandite consumption and hydrates



Thermogravimetry: comments

- Increasing the replacement percentage of fly ash generates various kinds of hydrates but at the same time there quantity is reduced.

Conclusions

- Portlandite consumption and hydrates generation seems to be the most effective way to identified fly ashes with high replacement potential.
- Fly ash 1 and 5 generates the biggest amount of hydrates.
- Medium and high calcium fly ashes present better performances for high replacements.
- Low LOI and high specific surfaces are recommended.